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I.—*Account of the Inscriptions upon two sets of Copper Plates, found in the Western part of Gujerát. By* W. H. Wathen, *Esq. Persian Secretary to the Bombay Government.*

[In a letter to the Secretary of the Asiatic Society.]

Several years since, I procured two sets of copper inscribed plates, one of which had been discovered by some laborers employed in digging the foundations of a house at *Danduca*, in the Peninsula of *Gujerát*; and the other in a similar manner, at *Bhavanagar*, in the same province: the inscriptions being, however, in a character unknown to the learned on this side of India, I found it impossible at that time to decypher them.

Encouraged, however, by the very interesting discoveries brought to public notice in your valuable Journal, as connected with the hitherto unknown character of the inscriptions on the Allahabad pillar, and the recent success of the Reverend Mr. Stevenson, I again endeavoured to decypher the two inscriptions, in which I derived much assistance from the alphabet given in your number for March, 1834; and having observed a repetition of the same letters in many parts of the inscription, I concluded these were the titles preceding the names of the kings of the dynasty, to which the prince making the grant belonged.

In consequence, I found from your key the words *Rája* (), and looking for *Mahá*, I discovered that the () of the inscription was *m*, instead of *sh*, which the alphabet given in the Journal would have made it. The title *Paraméswara* next struck me, and led to the discovery of *Parma Mahesvara*, and gave me a clue to the () p, of the character used; I had previously made out *Svasti*, of the com-

mencement; but it was long before I could understand the vowel mark *i*, (ै) which I took for *anuswara*; after these, and a few other letters had been ascertained, the first of the inscriptions was easily decyphered, with the aid of a learned pandit.

The second was more defaced, and after the greatest trouble, a part of it still remained unintelligible, the letters having become obliterated by the effects of time and damp.

They are both grants of lands to priests; the first is about fifteen hundred years old; and the date of the second, some hundred years subsequent.

Thinking that an account of these inscriptions, and of the character in which they are written, may be interesting to some of your readers, and throw some additional light on the ancient history of the west of India, I have ventured to trouble you with the accompanying paper, for insertion in your Journal.

A translation of the inscription A is transmitted, and the substance of the other will be given in the accompanying observations. W. H. W.

The character in which these grants are written, is evidently derived from the more ancient one which is found in the caves of *Kaneri*, of *Carli*, and *Verula* (Ellora), on this side of India; it also resembles that of the cave inscription decyphered by Mr. Wilkins in the first volume of the Asiatic Researches.

With the view of facilitating the future researches of antiquarians, who may meet with the same description of writing, a comparative alphabet of this character and *devanágarí*, (No. 1.) and a fac-simile of one of the inscriptions, interlined with the modern *devanágarí*, (No 2.) are annexed*.

One original character, being that found in the caves, appears to have first existed throughout the western parts of India, that is in the *Dakhan*, *Konkan*, *Gujerát*, and perhaps more generally. It seems to have undergone gradual changes, until about two centuries subseqnent to the æras of Vicra'maditya and Saliva'hana, an alphabet nearly similar, or identical with that at present noticed, would appear to have been introduced. In order to shew that there is considerable ground for

* See Plates XL. and XLI. We have separated the modern Sanscrit interlineation, which permitted of being set up in type, giving figured references to the lines of the more ancient Nágari lithographed in Plate XL. We have also ventured to omit the 3rd and 4th pages of the lithographed Alphabet, containing the compound consonants with their several vowel marks, as these combinations will be obvious to those who know the letters, and have the necessary examples before them in the inscription itself.—Ed.

such a supposition, copies of as many of the various cave characters, on this side of India, as could be easily procured, were collected and arranged in the order of what appeared to be their relative antiquity.

Selections from these, and also from grants of subsequent date to those which are here principally treated of, have been made to give an idea of the manner in which the ancient writing has gradually been changed to its present form : these are all taken from copper-plate and other inscriptions (which are deposited in the Museum of the Bombay branch of the Royal Asiatic Society). From one of these it appears, that up to *Saca* 730, or A. D. 808, no very material difference in the character had taken place. The accompanying lithographic plate (No. 3), contains specimens of varieties of writing from the most ancient times to the present*.

The hope of meeting with a key to the alphabet now decyphered, led to references to those of Tibet and other countries ; and a strong similarity was remarked between it, the *Kawi* (*Kávya Bhásha*) character of Java, used in that country when under the government of its Hindu conquerors, the *Páli* of Siam, and the alphabet of Tibet; from each of these, a few lines have been copied, by reference to which, the close resemblance of many of the letters to those of the inscription (No. 2), will be apparent.

Several of the provincial alphabets also have been evidently taken from this source, long before the remodeling of the present *devanágarí :* a few of the most striking coincidences are also given in the same plate with the above (No. 4).

The resemblance of this character to those of Tibet, and the sacred alphabets of Siam and Java, may perhaps tend to throw some light upon the æra of the conquest of Java, Sumátra, and several of the eastern islands by the Hindus, and also on that of the introduction of the Buddhist religion into Tibet, and the countries eastward of the Brahmaputra.

The contents of these inscriptions, as tending to elucidate the ancient history of Western India, at the commencement of the fourth century of the Christian æra, are of some interest, as will be pre-

* We defer the publication of these comparative alphabets, because we think they may be rendered more complete by the addition of those to which we have access on this side of India. Such a palæographical table has been long a desideratum, and Mr. Wathen's contribution will furnish a considerable portion of the list. Our recent inscriptions from Shekáwat, and Benares must, however, be added to complete it, and the various *Páli* offsets from the *Magadhi* require to be more fully developed.—Ed.

sently detailed : a list of the princes enumerated will be found in the Appendix, (No. 5).

In the first inscription, as well as in the second, the origin of this dynasty is traced to Bhatarca Senápati, who is said to have established his power by signal bravery and prowess: his capital named *Valabhipura**, is also expressly mentioned in the first grant ; both the founder of this sovereignty, and two first successors, did not take the title of king, but *Senápati*, or General, whence it may be inferred, that they were under a paramount sovereign, by whom the province of *Gujerát* was committed to their charge ; and it is stated in the description of the fourth prince of this family, that he was raised to the royal dignity by "the great monarch, the sole sovereign of the entire world," meaning India.

The third in succession to him, named Sridhara Sena, would appear to have thrown off all dependence on this paramount sovereign of *Ujayana* or *Kanouj ;* for by the date of the first inscription, the *Valabhi Samvat* or æra would appear to have been instituted in his reign, its date being *Samvat* nine : this circumstance induced the belief, at first, that the æra referred to was that of Vicramáditya, until on referring to the 1st volume of Tod's Rájasthan, the existence of a *Surya-vansa* dynasty in *Gujerát*, whose capital was *Valabhipura*, and title "*Bhatarca*," and also of a *Samvat*, or æra peculiar to those kings, as proved by Jaina legends, and inscriptions found at *Somnáth*, *Pattan*, &c. shewed that these grants must belong to those princes and their æra alone.

Colonel Tod established, from the materials already mentioned, the particulars of which may be seen on reference to his work†, the following historical data.

1. The emigration of a prince named Keneksen, of the *Surya-vansa*, or race of the sun, from *Koshala*‡ *dèsha*, and his establishing himself in *Gujerát* about A. D. 144.

2. The institution of an æra, called the *Valabhi Samvat*, by his successors, who became the independent kings of *Gujerát :* the first year of which æra was the 375th of Vicramáditya, or A. D. 319.

3. The invasion of the kingdom of the *Valabhi* princes by a barbarian force, the destruction of their capital *Valabhipura*, in A. D. 524, and the removal of thes eat of government to the north-eastern part of *Gujerát*, most probably at first to *Sidhapura*, about A. D. 554.

The inscriptions confirm, in a singular manner, these several epochs.

* In *Pracrit*, it is written with a *b*, "*Balabhi.*"

† See the chapter entitled "Annals of Mewár." ‡ The present Oude.

The first inscription is dated 9th *Valabhi Samvat*, corresponding with 384 of VICRAMA'DITYA, and A. D. 328.

Now allowing twenty years for the average reign of the six princes of the first inscription, this will give 129 years for the interval between SRIDHARA SENA, in whose reign this æra may be supposed to have commenced, and BHATARCA SENÁPATI, the founder of the dynasty, which will place him as having lived in A. D. 190, or within forty-six years of the time specified by TOD, as that of KENEKS'EN's establishment in *Gujerát*. That *Bhatarca* was a family title, and not the real name of this chief, is shewn by its being alone used in the seals affixed to both the inscriptions.

From the second inscription, we have a long line of princes, the last of whom, SILÁDITYA MUSALLI, would appear, from an allusion therein, to have removed the capital to *Sidhapura*.

Taking the number of kings, whose names are given subsequent to SRIDHARA SENA, the founder of the *Valabhi* æra, at twelve, and the length of their reigns at an average of twenty years each; this calculation will shew a term of about 240, or more years, to have elapsed from this time, to that of SILÁDITYA MUSALLI of *Sidhapura*, or A. D. 559, about thirty-five years after the sack of *Valabhipura* by the barbarians.

On referring to the list of kings, another of the name of SILÁDITYA, it will be seen, just preceded the prince who made the grant contained in the 2nd inscription, whose reign will thus approximate to A. D. 524, stated in the *Jaina* legends to be the date when the capital was surprised by a foreign army. From the same source also, we find the name of the prince who then reigned, to have been SILÁDITYA, as above.

These coincidences are curious, and tend to confirm the authenticity of those fragments of early Hindu history, which TOD has so carefully collected.

The *Jaina* historical legends all mention the kings of this dynasty, and their æra, the *Valabhi Samvat;* the capital, from its geographical position, would appear to have been the Byzantium of PTOLEMY; its kings were of the dynasty called by foreigners the *Balhára*, which may have been a corruption of the title *Bhatarca**, or derived from the adjoining district of *Bhala*, and *Rai* or prince; the absurd manner in which Hindu names were, and still are, corrupted by the Arabs, and other foreigners, may easily account for the difficulty of reconciling real names with their corruptions.

* Bhatarca, literally means cherishing sun; it is a royal title.

It is a singular circumstance connected with the destruction of *Valabhipura*, that it would appear to have been conquered by a *Mhlechha*, or Bactro-Indian army, which, it may be presumed, came from a Bactrian kingdom then existing, in which were probably comprised the present *Múltán*, *Sindh*, *Cachha*, and perhaps many other provinces; whether this state became subsequently divided into several petty principalities, one of which held the southern part of *Sindh* and *Cachha*, is a query which remains to be solved; the southern part of *Sindh*, however, has been known from the most ancient times, by the appellation of *Lar*, which would be in Sanscrit *Larica*: now the kingdom of Larike is mentioned expressly by Ptolemy, but is made to comprise the coast of *Gujerát*, which might have been conquered by it; the strongest fact in support of this theory is, that many Bactro-Indian* coins, with the head of the prince, evidently of inferior Greek workmanship, something similar to those found at the *Manikyála Tope*, &c. have been found in great numbers in *Cachha*, and in parts of *Saurásktra*†.

It may be here mentioned, that it is from this very family of *Valabhipura*, that the legends of the present Ránas of *Udayapur* (Oodipoor) deduce their descent.

After reigning some years in the north of *Gujerát*, the power of the dynasty was destroyed, its kingdom dismembered, and the city of *Anhalwara Pattan* became the capital, under the succeeding dynasties of the *Chawura* and *Chalukia* (vulgo *Solanki*) races.

Both of these grants convey fields to brahmans as religious gifts. The lands granted in the second inscription are stated to be situated in *Saurásktra*, and the donees are said to have come from *Girinagara*, (*Júnagur* or *Girnal*,) and to have settled at *Sidhapura*.

Two facts, proving the great antiquity of these grants, are,—first, the measure of land being square paces; and the other, the existence of the worship of the sun: one of the princes is named as being of that sect.

In the course of antiquarian researches in India, we cannot but remark the very opposite course pursued by the *Jainas*, and the *Brahmans*, in regard to the preservation of historical legends; the *Brahmans* are accused by the *Jainas* of having destroyed, wherever they

* These are probably the Greek coins Arrian meutions as current at *Barigaza* or Broach. [We shall, I trust, hear more of these coins from Col. Pottinger or Capt. Burnes. It is essential to know to which of our new series they belong.—Ed.]

† Saurásktra, or the region of the worshippers of the sun, comprised the whole of the peninsula at present called Kathiawar.

gained the supremacy, all the historical books in existence, which related facts anterior to the Musalman conquest; and we certainly do not find in the *Dakhan*, and other countries which have been long under their exclusive influence, any thing whatever prior to that period; whereas, on the contrary, the *Jainas* have treasured up in their libraries, every historical legend and fragment that could be preserved by them.

May it not be inferred, that the brahmans, sensible of the great changes introduced by themselves to serve their own avaricious purposes, in the Hindu worship, at the æra of the Musalman conquest, neglected the preservation of the historical works which then existed; for as no king of their own faith remained, and their nobles and learned men must have lost their power and influence, no one was left who took any interest in their preservation; and it appears probable, that at such period, the *Puránas* were altered, and the novel practices now existing introduced, to enable these wily priests still to extort from the superstition of the people, what they had formerly enjoyed by the pious munificence of their own kings.

The *Jainas* indeed assert, that the *Puránas* are mere historical works; that Parasuráma, Rámachandra, Krishna, &c. were merely great kings, who reigned in *Oude* and other places, and have not the slightest pretensions to divinity.

It may tend to confirm this theory, when we consider, that all the great reformers of the Hindu religion, whose doctrines and whose expositions of that faith are now followed, flourished about the same period when India was thrown into confusion by the invasions of those ferocious and fanatical barbarians, the Arabs, the Turks*, and Afghans, or from five to eight hundred years back; Sankara A'chárya, Valabha A'chárya, and Ramanuja A'chárya, are all supposed to have lived between those periods.

The great Hindu sovereigntics falling to pieces, it became impossible to perform sacrifices requiring such prodigious expenditure†, the kings of foreign faith, no longer ruling by the Shástras, no check existed to the intermixture of castes: hence the Warna Sankara; the *Kshetriyas* overcame, and fleeing from their foes, emigrated into various parts, laid down the warlike profession, and engaged in civil and commercial pursuits: hence the present *Kshetri*, the *Prabhi*,

* By Turks, I mean natives of Central Asia.

† Such as *Asvamedha*, &c., notwithstanding the assertions of the brahmans that these sacrifices of the horse, &c. have been abolished in this *Kali-yuga*, we find instances of their performances recorded in inscriptions of 800 years and later date.

the *Bhatti*, &c. once warriors, now scribes and merchants; the brahmans then, to raise themselves, and degrade the other castes, invented the fable of the destruction of the whole *Kshetriya* tribe by Parasuráma—a thing in itself incredible; but which story enabled them to substitute the Puránas, for the Vedas, in conducting the sacred offices, as connected with those classes.

Further, if we inquire into the origin of many of the present most popular incarnations, as worshipped in western India, we shall no doubt trace them to the æra when the Puránas were interpolated and converted from mere historical legends into books of scripture. A new impetus was thus given to superstition, by the discovery of these supposed miraculous emanations of Siva, Vishnu, and Ganesa, in the shape of *Khundeh Rao**, *Wittoba*, and the *Chinchwara Ganapati*.

That great changes were introduced about the period of the Musalman invasion, into the practices of the Hindu religion, and that many as they now exist, are far different to what they were previous to that æra, are facts which will become better known and ascertained, as the antient history of the country becomes more cleared from the obscurity in which it is at present involved.

Translate of an ancient Inscription, dated 9th of the Valabhi Samvat, or A. D. 328, and found in digging the foundations of a house, near Danduca, in the Peninsula of Gujerát, or Saurástra.

May prosperity (ever emanate) from the city of *Valabhi!* The possessor of incomparable strength from the crowds of powerful enemies and friends, who prostrate themselves (before him), who earned glory in hundreds of battles fought in the countries of his foes; whose prowess and renown dazzled (the eyes of the princes of the universe), one enjoying the affections (of his subjects) by grants of rewards and honors, and also by courteous behaviour. The acquirer of royal prosperity by the strength (aid) of his numerous dependents and attached friends, great adorer of *Mahesvara* (Siva), (such was) Senápati Bhatarca (Bhatarca, the general-in-chief).

His son, with head tinged of a reddish colour, by constant inclination to the dust of his father's feet, and thus rendered pure: the lustre of the nails of whose feet (as mirrors) surpassed the diamonds of Sucra's diadem, whose riches were a constant source of relief to the poor, helpless, and destitute, (was the) great worshipper of *Mahèsvara*, Srí Senápati Dhára Sena (the general of the forces, Dhára Sena).

His younger brother with forehead wholly sanctified by prostrations at his (brother's) feet, a performer of all the acts of devotion accord-

* These are all peculiar to the *Mahratta* country, their temples being at *Jejury*, *Pundarpur*, and *Chinchwar*.

ing to the precepts of MENU, and other holy saints, who, like DHARMA RÁJA (YUDHISTHIRA), has arranged all laws, received his inauguration to the throne, "from the Great Sovereign* himself, the sole monarch of the entire world," and whose accession to royalty was solemnized by unbounded gifts. He was the great worshipper of *Mahesvara*, Srí Mahárája DRONA SINHA (the fortunate king, DRONA SINHA.)

His younger brother, who by the prowess and force of his sole arm, as a lion, conquered the hosts of his enemies, mounted on elephants, the asylum of all those who sought a place of refuge, conversant with all the various principles of science,—a celestial, all-yielding tree to friends and dependants, affording to all enjoyments according to their several wishes and tastes; great follower of BHAGAVATA (VISHNU) (was) Srí Mahárája DHARUVA SENA.

His younger brother, all whose sins were removed by prostrations before the lotus-resembling feet of his (elder) brother, by whose virtuous conduct, as a pure stream, the crimes of the *Kali-yuga* were washed away; whose fame was celebrated by crowds of vanquished enemies, was the great adorer of the sun, Srí Mahárája DHARAPATTAH.

Whose son acquired the chief of virtues by adoration of his father's feet; whose sword from his infancy was his sole helper; who distinguished himself as the touch-stone of bravery; the destroyer of multitudes of foes resembling intoxicated elephants. The bright lustre of the nails of whose feet were reflected by the splendour of the crowds of his prostrate enemies; who fulfilled the import of the title "Rája," by delighting the hearts of his subjects, and affording them protection, (and by governing,) as commended in the *Smritis* (holy books); who surpassed SVARA (Cupid) in beauty, the moon in splendour, the monarch of mountains (*Himálaya*), in fixedness of purpose. In depth (of thought and counsel) the ocean, the teacher of the gods in wisdom, the great master of riches (CUVERA) in wealth; who relinquished as straw, the fruits of his enterprises, in his anxiety to remove the fears of those who sought protection; delighter of the hearts of the learned of friends and dependants, by bestowing riches far beyond their desires; who enjoyed all the gratifications and luxuries of the various countries in the world, as one who had himself travelled through them, (was) the great worshipper of *Mahesvara*, Srí Mahárája GRIHA SENA.

His son, for ever fortunate by the rays proceeding from the diamond-like nails of his father's feet;—all whose sins are washed away by the pure water of the *Ganga* (Ganges); whose wealth and prosperity are participated in by multitudes of friends and dependants:—in whom all the qualities of beauty, have taken up their abode, as if by the desire of associating with the beauties of his form; who has astonished all those skilled in archery, by his wonderful natural skill, improved as it is by superior and constant exercises; the maintainer of all pious grants, bestowed by the will of ancient kings: he that removes from power, those (evil ministers) who seek the ruin of his subjects:—a unique example of the abode of wisdom and

* This evidently refers to some one of the successors of VICRAMA'DITYA and SHA'LIVA'HANA. The *Pramara* or *Powar* kings of Ujain or Canouj.

prosperity, in one and the same person, whose renown is alone sufficient to destroy the power of his foes, whose royal dignity is heriditary;—great worshipper of *Maheswara*, powerful wielder of the battle-axe, Srí Mahárája Sridhara Sena,—peremptorily issues these his mandates!

To those in office, and those unemployed; to the governors of towns; to the chiefs of districts, revenue officers, forest chiefs, protectors of the roads, &c. &c. and all officers howsoever employed!

'Be it known to you! that for the increase of my father's and mother's holiness, for my own salvation, and for the sake of obtaining other objects of my heart's desire, in this and in the next world, I have granted fifty paces of land, (situated) at the southern boundary of the village of *Matsira*, and sixty paces of land near the northern limit of *Veraputri*, to a *Lodrita* brahman, learned in the *Rig-Véda* of the same *gotra* (family), as Kaina and others: also a piece of land of fifty paces, on the western side of *Prathapura*, and eight paces near *Ishvara Deva Senak* is likewise granted to a *Rig-Véda* brahman, named Deva Sila of the same *gotra*, as Trivalam Bayana, &c. (this part is very unintelligible in the original,) this land, with the hamlets and other things thereunto pertaining, with its earth, water, wind, sky, spirits, grain, and gold, is (hereby) given, with all that which may thereupon be produced.

'All the ministers of state must avoid placing their hands on this, as they would on the hole of a serpent; for the constant and due performance of the five great sacrifices (naming them), I have given this; for as long as the moon, sun, seas, rivers, and this world shall exist, to be enjoyed by the descendants, sons, grandsons, &c. By pouring out water, (it is) given up as a brahmanical gift; to be enjoyed on the terms usual with such grants; they may plough, cause to be ploughed, or give it away. No one should cause any hindrance (to this grant).

'Future pious kings, both of our family, and others, who will appreciate the fruits of a grant of land, should approve and maintain this my gift. (Here the usual quotations from the *Mahá Bhárata* are introduced, quoting the gift by king Sagara, and shewing the sin of destroying such a grant of land).

'Written by the minister for peace and war, Scanna Bhatta, *Samvat* 9, Vaisháca vadi 8. I, Mahárája Sri'dhara Sena, the heroic, my pleasure! my hand!'

List of kings of the Valabhi or Balhára dynasty, as found in the two inscriptions.

A. D. 144 or 190	1.	Senápati Bhatarca.
	2.	Dhara Sena.
	3.	Mahárája Drona Sinha.
	4.	Dhruva Sena, I.
	5.	Dharapattah.
	6.	Griha Sena.

Transcript of the Inscription in the modern Devanágarí character.

1 स्वस्तिवल्लभोनः प्रसभप्रणतामित्राणां मैत्रकाणामतुलबलसपत्नमण्डलाभोगसंसक्तसंग्रहारब्धतन्त्र
2 व्यप्रतापः प्रतापः प्रतापोपनतदानमानार्ज्जवोपार्ज्जितानुरागोनुरक्तमौलभृतमित्रश्रेणीवलावाप्तराज्य
3 श्रीः परममाहेश्वरः श्रीसेनापतिभटार्कस्तस्यसुतस्तत्पादरजोरुणावनतपत्रिचोदितशिराः शिरोवनत
4 शक्रचूडामणिप्रभाविच्छुरितपादनखपंक्तिर्दीधितिर्दीनानाथकृपणजनोपजीव्यमानविभवः परममाहेश्वरः
5 श्रीसेनापतिधरसेनस्तस्यानुजस्तत्पादाभिप्रणामप्रशस्ततरविमलमौलिमन्त्रादिप्रणीतविधिविधानधर्म्मो
6 धर्म्मराज इव विहितविनयव्यवस्थापद्धतिरखिलभवनमण्डलाभोगैकस्वामिनापरमस्वामिनाख्य
7 मुपद्धितराज्याभिषेको महाविश्राणनावपूतराजश्रीः परममाहेश्वरः श्रीमहाराजद्रोणसिंहः सिंहइव
8 तस्यानुजः स्वभुजबलपराक्रमेण परगजघटानीकानामेकविजयी शरणैषिणां शरणमवबोद्धा
9 श्राखार्थतत्त्वानां कल्पतरुरिव सुहृत्प्रणयिनां यथाभिलषितफलोपभोगदः परमभागवतः श्रीमहाराज
10 ध्रुवसेनस्तस्यानुजस्तच्चरणारविंदप्रणतिप्रविधौताशेषकल्मषः सुविशुद्धस्वचरितोदकक्षालितसकल
11 कलिकलंकः प्रसभनिर्ज्जितारातिपक्षप्रथितमहिमा परमादित्यभक्तः श्रीमहाराजधरभट्टः तस्यात्मजस्तत्पादसपर्यावाप्त
12 पुण्योदयः शैशवात्प्रभृतिखड्गद्वितीयबाहुरेव समदपरगजघटास्फोटनप्रकाशितसलिलनिकषः तत्प्रभावप्रणतारति
13 चूडारत्नप्रभासंसक्तसव्यपदनखरश्मिसंहतिः सकलस्मृतिप्रणीतमार्गसम्यक्परिपालनप्रजाहृदयरंजनाद्य
14 थाराजशब्दोरूपकान्तिस्थैर्य्यगाम्भीर्य्यबुद्धिसंपद्भिः स्मरशशाङ्काद्विराजोदधिचिदशुरुधनेशानतिशयानः
15 शरणागताभयप्रदानपरतयाहतवदपास्ताशेषसकार्यफलः प्रार्थनाधिकार्थप्रदानानन्दित
16 विद्वत्सुहृत्प्रणयिहृदयः पादचारीव सकलभुवनमदाभोगप्रमोदपरममाहेश्वरः श्रीमहाराज
17 गुहसेनस्तस्यसुतस्तत्पादनखमयूखसन्ततनिर्वृत्तजाह्नवीजलौघविच्छालितशेषकल्मषः
18 प्रणयिशतसहस्रोपजीव्यभोगसंपत् रूपलोभादिवाश्रितःसरसमभिगामिकैर्गुणैः
19 सहजशक्तिश्रिचाविश्रेषविस्मापिताखिलधनुर्द्धरः प्रथमनरपतिसंमतिस्थानानुपालयिता धर्म्मदा
20 यानामपाकर्त्ता प्रजोपघातकारिणामुपप्लवानां दर्शयिता श्रीसरस्वत्योरेकाधिवासः संहतारति
21 पक्षलक्ष्मोपरिक्षोभदक्षविक्रमः क्रमोपमंप्राप्तविमलपार्थिवश्रीः परममाहेश्वरोमहाराजश्रीधरसेनमुग्रली
22 सर्व्वानेवायुक्तकविनियुक्तकद्रांगीकमहत्तरचाटभटशौल्किकचाटभटादीनन्यांश्च यथासंबध्यमानका
23 ञ्समाज्ञापयत्यस्तु वः संविदितं मया मातापित्रोः पुण्याप्यायनायात्मनश्चैहिकामुष्मिकयथाभिलषितफलावाप्तये मटसर
24 सि दक्षिणसोम्नि पादावर्त्तापंचाशत्तथावीरपुत्रे उत्तरसोम्नि पादावर्त्तापष्टिवह्वृचकैरादित्यगोत्रब्राह्मणचुद्रसख्येदंशथ
25 पुत्रदीश्वरदेवसेनके अपरसोम्नि पादावर्त्तापञ्चाशत्वह्वृचतथाचैवालंबायनसगोत्रदत्तिल्लाय पादावर्त्ताश्चीतिवत
26 सोद्रङ्गसोपरिकरसवातभूतधान्यहिरण्यादि देयं सोत्पद्यमानविष्टिकं समस्तराजकीयानामहसप्रत्ये
27 षणीयं भूमिच्छिद्रन्यायेनैषामेव च बलिचरुवैश्वदेवाग्निहोत्रातिथिपंचमहायज्ञिकानां क्रियाणां समुत्स
28 र्ज्जणार्थमाचन्द्रार्कार्णवसरित्तिस्थितिसमकालीनं पुत्रपौत्रान्वयभोग्यं उदकसर्म्मणब्रह्मदेयं निसृष्टं
29 यतोसोचितया ब्रह्मदेयस्थित्याभुंजतां क्षपतंकर्षयतां प्रदिशतां वा नकेनचित्प्रतिषेधेवर्त्तितव्यमा
30 गामिभद्रन्वपतिभिरस्मद्वंशजैरन्यैश्चैश्वर्य्याण्यस्थिरंमनुष्यं सामान्यं च भूमिदानफलमवगच्छद्भिः
31 अयमस्मदाज्ञेयानुमंतव्यः परिपालयितव्यश्च यश्चैनमाच्छिंद्यादाच्छिद्यमानं वानुमोदेत सपं
32 चभिर्महापातकैः सोपपातकैःसंयुक्तःस्यादित्युक्तं च भगवता वेदव्यासेन व्यासन । षष्टिवर्षसह
33 स्राणि स्वर्गे तिष्ठति भूमिदः । तच्छेत्ता चानुमंता च तान्येव नरके वसेत् ।। पूर्व्वदत्तां द्विजातिभ्योयत्ना
34 द्रक्ष युधिष्ठिर । महीं महीमतां श्रेष्ठ दानाच्छ्रेयोनुपालनम् ।। बहुभिर्वसुधाभुक्ता राजभिःसगरादिभिः
35 यस्ययस्ययदाभूमिस्तस्यतस्यतदाफलमिति ।। लिखितंसन्धिविग्रहाधिकृतस्कन्दभटेन ।। संवत् १ ।।
36 स्वहस्तोयम महाराजश्रीधरसेनस्यदूतविर्वीरः । वैशाखवर्णना

On the Seal, under the bull, श्री भटार्क :

A. D. 300	7.*	Sri'dhara Sena, I.†
	8.	Siladitya, I.
	9.	Charagriha, I.
	10.	Sri'dhara Sena, II.
	11.	Dhruva Sena, II.
	12.	Srídhara Sena, II.
	13.	Siladitya, II.

At this part of the copper-plate the writing is so obliterated, that the names of two or three princes cannot be made out.

	16.	Mahárája Charagriha, II.
A. D. 524	17.	Siladitya, III.
A. D. 559	18.	Siladitya Musalli, IV.

The first two princes have the title *Senápati* alone. All those subsequent to No. 3, *Mahárája*. The whole had the title of "Sri' Bhatarca," and the device on their banner, was the "Nandi," or sacred bull of Siva, as appears from the seals attached to both inscriptions.

II.—*Synopsis of the Thár and Ghorál Antelopes.* *By* B. H. Hodgson, *Esq., Resident in Nipal.*

[In a letter to the Secretary As. Soc. read 7th Oct.]

I beg to forward to you, herewith, synoptical descriptions of the Thár and Ghorál Antelopes, derived from careful examination of a great many individuals of both sexes, which were either alive or recently killed at the time of examination. These descriptions are preceded by an amended definition of the group to which the animals belong; that given by Smith in the English Regne Animal being so inaccurate, as to be calculated only to lead the inquirer astray. Mine, now proposed, is drawn from an intimate knowledge of three out of the four species comprising the group. But it is probable that very much yet remains to be done before the vast genus Antilope can be successfully divided into subgenera, fitted either to illustrate natural affinities, or even to render perfect, facility of reference. Mr. Owen has, since the publication of the English Cuvier, recast this entensive genus in a manner very different from Smith's, though not, I think, superior to it. Considering, indeed, how extremely superficial is our knowledge of the greater part of this vast assemblage of the hollow-horned

* These seven are from the first inscription, the following from the second inscription.

† A. D. 319. In his reign, the Valabhi æra is supposed to have commenced.

ruminants, it might be as well, perhaps, for our general classifiers, to bear in mind the Baconian adage, that " an over-early reduction of knowledge into methods generates acquiescence" in misleading systems of nature.

My apology for the amended indication of the subgenus NÆMORHEDUS of the English Regne Animal, now attempted, is, that the celebrity of that work might fix and propagate errors which I happen to possess the means of correcting; and that, as I have an unusually complete knowledge of three out of the four species comprised in this group, my definition of it may perhaps stand the test of time, if the group itself be allowed to remain.

Nipal, August 1835.

English Regne Animal Synopsis.

Sub-Genus XIII. Næmorhedus, SMITH.

Subgeneric character (*nobis*).

Structure assuming a caprine form, suited for heavy climbing, or for leaping; horns in both sexes, their cores hollow*, and connected with the frontal sinuses, but not porous, and only sub-cellular, inserted behind the orbits, short, conical, simply bent back, annulo-wrinkled, parallel to the plane of the face, and nearly so to each other, subremote at base; suborbital sinus, small, or wanting; no inguinal pores; tail caprine; ears longish, pointed, and striated; muzzle small, or none; knees callous? maned, hair of two sorts, and thick; or, of one sort, and spare; four teats in the females. Reside in the mountainous and woody regions of the continent and islands of India, solitarily, or in small groups.

Sp. 1. A. SUMATRENSIS. *Cambing Ootan.*

Sp. 2. A. DUVAUCELLII. Variety of *Ghorál!*

Sp. 3. A. GUORAL. Characters—extremely caprine, being allied to antelope only by its round and ringed horns. Size small, attitude gathered, with back much arched, and structure adapted for leaping; limbs moderately stout and rigid; general form of the scull caprine, with the ridge line much bent, and the parietes depressed at a strong angle to the frontal bones, and no indentation before the orbits; fifty inches long, exclusive of the tail, and twenty-seven high; horns seated on the crest of the frontals, six inches long, the points inclined inwards, 20 to 25 annuli extending $\frac{2}{3}$rds up the

* This, as a generic character, has been used to separate Capra and Damalis from Antelope; upon which I have only to observe, that I know four species still retained under Antelope, which have nevertheless hollow-cored horns.

horns; annuli crowded and vague, especially towards the bases, somewhat interrupted by faint longitudinal striæ, truncated, independant of each other, and equally developed all round; no suborbital sinuses, a half muzzle; upper lip clad, tail conico-depressed, and only half nude below; fur of two sorts, abundant and loosely applied to the skin; a short, semi-erect mane on the vertex. Knees usually callous and nude, but not congenitally so; colours of the animal rusty and brown, paler below; line of the vertex, tail, chest, and a stripe down the front of the fore legs and back of the hind, brown black; outsides of ears rusty, lips and chin rufescent white, a large patch of pure white at the junction of the head and neck, below; horns, hoofs, and muzzle, black; iris, dark hazel; eye, mean. Inhabits juxta Himálayan region of Nipal. Female smaller and paler hued; young, redder and no marks or mane.

Sp. 4. A. Tha'r, nobis. The *Thár* of the Nipalese. New. Characters less decidedly caprine than in the last, very nearly allied to the *Cambing Ootan*. Back straight, withers higher than the croup, and structure suited for heavy climbing, not for leaping; limbs very stout and rigid, with higher hoofs than in the last, the edges of which are raised above the pads. General form of the scull cervine, with the ridge line *moderately* convexed, and the parietes *not* depressed at a strong angle to the frontal bones. A deep indentation before the orbits. Horns posterior to orbits, but below the crest of frontals, eight inches long, rather stouter and less falcated, than in the preceding, sub-divergent, with the points inclined outwards, 20 to 30 crowded annuli, extending $\frac{2}{3}$rds up the horns, the annuli truncated, equal all round, independant, broken by decided longitudinal striæ; one inch below the eye, a suborbital sinus, opening on a nude space by a round puncture, and furnished with a fleshy thick gland secreting a viscous humour, as in Sumatrensis; no maxillary sinus, a half muzzle; larger than in the preceding, but existing only as a broad line in front of the upper lip, which is otherwise clad in hair. Tail shorter, depressed nude below; fur of one sort only, scanty, harsh, and applied to the skin; a semi erect-mane, as in *Ghorál;* knees, callous, perhaps congenitally so. Sternum not so, size large, 64 inches long by 38 high, and upwards of 200 lbs. in weight. Colour of the whole animal above, with the entire head and neck, jet black; on the flanks, mixed with deep clay red. The fore arms and hams outside, as far down as the great flexures, clay red, nearly or wholly unmixed; rest of the limbs, hoary, or rufescent hoary; outsides of ears, dark; chest, pale. No stripes down legs; lips and chin dull hoary, and a stripe of pure hoary running

backwards over the jaws from the gape; horns, hoofs, and muzzle, black; iris, dark hazel; eye, mean.

Female as large as male, and like him in all essential respects. The young, paler, and mixed with gray.

Inhabit the precipitous and wooded mountains of the central region of Nipal, which they rush up and down with fearful rapidity, though they do not spring or leap well, nor are speedy.

The *Thár* species are denominated *Sarau*, in the western parts of these mountains, where it is as common as in Nipal. The *Cambing Ootan* is its analogue in the Indian *Islands*; but the species is not found, I believe, in any other mountainous range of the continent of India.

III.—*On the Wild Goat and Wild Sheep of the Himálaya, with Remarks on the genera Capra and Ovis. By* B. H. Hodgson, *Esq. Resident in Nipal.*

In the way of classification, there are few objects, I believe, more important than the establishment of some distinctive marks to separate *Antilope*, *Capra* and *Ovis*. The best naturalists of the present day appear to think that M. Geoffroy's diagnosis of the former genus, viz. cores of the horns solid, may be relied on. But small as is the number of Antelopes accessible to me, I have proved with the saw, that in respect to at least four species, (viz. *Chírú*, *Thár*, *Goral*, and *Duvaucellii*,) the fact is not so, all these four having sinuses in the cores of their horns, connected with the frontal sinuses: and, if it be objected, that of three of these the character is confessedly osculant towards *Capra*, that cannot be urged against the fourth, which is a *Gazella* of H. Smith's group.

It is certain, therefore, that solid horns constitute not an *invariable* character of the genus Antilope; and it is highly probable, that this character is *not* of *such general prevalence* as to warrant the distinction founded upon it.

The truth seems to be this, that in *Antilope*, the bony nuts of the horns are of a compact structure, possessing at their bases sinuses of only limited extent, and nearly free from cellular partitions; whereas in *Capra*, and yet more in *Ovis*, the cores are porous and uncompact, and furnished at their bases with large sinuses, crowded with cells*.

On the present occasion, I do not propose to make any further mention of the genus *Antilope*, but to confine myself to some remarks

* The form of the scull a long vertical line, forms a much better diagnosis than the cores of horns.

tending to illustrate the distinctions between *Capra* and *Ovis*, and more particularly, to test the accuracy of those indications which are generally admitted by authors, by applying them to the wild species of either genus which belongs to the Himálaya.

For the last two years, I have had alive in my garden, a splendid specimen of the mature male of each, and I have frequently compared them together in all respects of manners and of structure. As the goat in question, as well as the sheep is new*, I will begin with a synoptical description of the two, and then proceed to notice the points of difference and agreement existing between them.

Tribe Capridæ—H. Smith.

Genus—*Capra*, Ditto.

Species—C. Jháral. New, the Jharal of the Nipalese.

Affined to the Alpine *Œgagri*, and to *Jemlaïca*. Adult male, 50 to 56 inches long from snout to rump, and 36 to 40 high. Head finely formed, and full of beauty and expression. Clad in close short hair, and without the least vestige of a beard; facial line, straight; ears small, narrow, erect, rounded at tips, and striated; eye, lively; between the nares, a black moist skin, nares themselves short and wide; knees and sternum, callous; tail, short, depressed, wholly nude below. Animal of compact, powerful make, with a sparish, short, and bowed neck, deep barrel and chest, and longish, very strong and rigid limbs, supported on perpendicular pasterns and high compact hoofs; false hoofs conic and considerably developed; attitude of rest gathered and firm, with the head moderately raised, and the back sub-arched. Shoulders decidedly higher than the croup; fore quarters superb, and wholly invested in a long, flowing, straight, lion-like mane, somewhat feathered vertically from the crown of the withers, and sweeping down below the knees; hind-quarters poor and porcine, much sloped off from the croup to the tail, and the skin much constricted between the hams behind; fur of two sorts—the outer hair of moderate harshness, nor wiry nor brittle, straight, and applied to the skin, but erigible under excitement, and of unequal lengths and colours; the inner, soft and woolly, as abundant as in the wild sheep, and finer, of one length and colour. Horns 9 to 12 inches long, inserted obliquely on the crest of the frontals, and touching at base with their anterior edges, sub-compressed, sub-triangular, and uniformly wrinkled across, except near the tips, where they are rounded and smooth; keeled and sharpened to the front, obtusely rounded behind: the

* My own imperfect account of both, in the Society's Transactions, is the only one extant.

edge of the keel not nodose, and usually but faintly marked by the continuation over it of the transverse wrinkles of the horns.

The horns are divergent, and directed more upwards than backwards: their points are slightly inclined inwards. The colour of the animal is a saturate brown superficially, but internally, hoary blue; and the mane, for the most part, *wholly* of that hue; fore arms, lower part of hams, and backs of the legs, rusty; entire fronts of the limbs, and whole face and cheeks, black-brown; the dark colour on the two last parts divided by a longitudinal line of pale rufous, and another before the eye, shorter; lips and chin hoary, with a blackish patch on either side below the gape; tip of tail and of ears, blackish; tongue and palate, and nude skin of tips and muzzle, black; iris, darkish red hazel. Odour very powerful in the mature male, especially at certain times. Is found in the wild state in the Kachár region of Nipal, in small flocks or solitarily; is bold, capricious, wanton, eminently scansorial, pugnacious, and easily tamed, and acclimatised in foreign parts.

Remarks. *Jhâral* is closely affined by the character of the horns to the Alpine *Œgagri*, and still more nearly, in other respects, to *Jemlaïca*. It differs from the former by the less volume of the horns, by their smoother anterior edge, and by the absence of the beard;—from the latter, by horns much less compressed and nodose. *Jharal* breeds with the domestic Goat, and perhaps more nearly resembles the ordinary model of the tame races than any wild species yet discovered. The western type of the Himálayan wild goat (called *Tehr*, at Simla and Musúri) has the anterior edge of the horns decidedly nodose, though less so than in *C. Jemlaïca*.

The Wild Sheep. Genus—*Ovis*.

Species—*O. Náhoor*, mihi.

The *Náhoor* of the Nipalese. New? variety of *O. Musmon*? Closely affined to *Musmon*, of which it is possibly only a variety. Adult male, 48 to 54 inches from snout to rump, and 32 to 36 high. Head coarse and expressionless, clad entirely in close short hair, without beard on the chin or throat, or any semblance of mane. Chaffron considerably arched. Ears medial, narrow, erect, pointed, striated. Eye dull, moist space between the nares, evanescent; nares narrow and long. Knees and sternum callous; tail medial, cylindrico-depressed, only $\frac{1}{2}$ nude below. Structure moderately compact, not remarkable for power. Neck sparish, bowed, with a considerable dip from the crown of the shoulders. Limbs longish, firm, but slender, not remarkable for rigidity, and supported on laxer pasterns, and on hoofs lower and less compact than

the goats ; false hoofs mere callosities. Attitude of rest less gathered and firm, with the head lower and the back straight. Shoulders decidedly lower than croup ; fore-quarters not more massive than the hind, nor their extremities stronger. Hair of two sorts—the outer hair, of a harsh, brittle, quill-like character, serpentined internally with the salient bows of one hair fitting into the resilient bends of another, but externally, straight and porrect from the skin, very abundant, and of medial uniform length all over the body : the inner coat, soft and woolly, rather spare, and not more abundant than in the Goat. Horns, 22 inches along the curve, inserted high above the orbits, on the crown of the forehead, touching nearly at base with their whole depth, and carrying the frontal bones very high up between them ; the parietals being depressed in an equal degree. The horns diverge greatly, but can scarcely be said to be *spirally* turned. They are first directed upwards, considerably before the facial line, and then sweep downwards with a bold curve : the points again being recurved upwards and inwards. They are uncompressed, triangular, broadly convexed to the front, and cultrated to the back. Their anterior face is the widest, and is presented almost directly forwards ; their lateral faces, which are rectilinear, have an oblique aspect, and unite in an acutish angle at the back. They are transversely wrinkled, except near the tips, which are round and smooth. Colour pale.

The colour of the animal is a pale slaty blue, obscured with earthy brown, in summer overlaid with a rufous tint. Head below, and insides of the limbs and hams, yellowish white. Edge of the buttocks behind and of the tail, pure white ; face and fronts of the entire limbs and chest, blackish ; bands on the flanks, the same, and also tip of the tail. Tongue and palate dark. Nude skin of lips and nose black. Eye yellow-hazel. No odour. Is found in the wild state in the Kachár region of Nipal, north of the Jhára1, amid the glaciers of the Himálaya, and both on the Indian and Tibetan sides of the snowy crest of that range. Is sufficiently bold and scandent, but far less pugnacious, capricious, and curious, than the *Jhára1*. Much less easily acclimatised in foreign parts than he is ; in confinement more resigned and apathetic, and has none of the *Jhára1's* propensity to bark trees with his horns, and to feed upon that bark and upon young shoots and aromatic herbs. I have tried in vain to make the *Náhoor* breed with tame sheep, because he will not copulate with them. The female of the species has the chaffron straight, and short, erect, sub-recurved, and greatly depressed horns. The young want, at first, the marks on the limbs and flanks, and their nose is straight.

Remarks. Differs from *Musmon*, to which it is closely allied, by the decided double flexure of the horns; their presence in the females, and the want of a tuft beneath the throat. With reference to the imperfect account of the *Náhoor*, published in the Transactions, I should not omit to say, in conclusion, that the *Náhoor* and *Banbhèra* are separate species, the former being the Himálayan type of *Musmon perhaps*: and the latter, certainly, that of *Ammon*.

Having now completed the descriptions of the wild goat and wild sheep, I shall proceed to the exhibition of the points of difference and of resemblance existing between the two, beginning with the former.

Goat.	Sheep.
Whole structure stronger and more compact.	Less so.
Limbs thicker and more rigid.	Feebler and more slender.
Hoofs higher and more compact.	Lower, and less so.
False hoofs well developed.	Evanescent.
Head smaller and finer.	Larger and heavier.
Facial line straight.	Chaffron arched.
Ears shorter and rounded.	Longer and pointed.
Tail short, flat, nude below.	Larger, less depressed and ½ nude only.
Withers higher than croup.	Croup higher.
Fore legs stronger than hind.	Fore and hind equal.
Croup sloped off.	Not so.
Odorous.	Not so.
Nose moister, and nares short and wide.	Less moist, and nares larger and narrower.
Horns of medial size, keeled and turned upwards.	Horns very large, not keeled and turned to the sides.
Eye darker and keener.	Paler and duller.
Hair long and unequal.	Short and equal.
Back arched.	Back straight.
Bears change of climate well.	Bears it ill.
Is eminently curious, capricious, and confident.	Is incurious, staid, and timid.
Barks trees with its horns, feeding on the peel and on aromatic herbs.	Does not bark trees, and is less addicted to aromatics.
In fighting, rears itself on its hind legs, and lets the weight of its body fall on the adversary.	In fighting, runs a tilt, adding hither the force of impulse to that of weight.

The goat and sheep have in common hair and wool; no beard; no suborbital sinuses; evanescent muzzle; no inguinal pores. Horns in contact at top of head; knees and sternum callous; angular and transversely wrinkled horns; striated ears; two teats only in the females: horns in both sexes, and incisors of precisely the same forms.

Of the various diagnostics, then, proposed by Hamilton Smith, it would seem, that the following only can be perfectly relied on to separate *Ovis* from *Capra*. Slender limbs; longer pointed ears; chaffron

arched; nares long and oblique; very voluminous horns turned laterally with double flexures. I should add myself, the strong and invariable distinction;—males not odorous, as opposed to the males odorous of the genus *Capra*. But, after all, there are no physical distinctions at all equivalent to the moral ones, so finely and truly delineated by Buffon, and which, notwithstanding what H. Smith urges in favour of the courage and activity of sheep, will for ever continue to be recognised as the only essential diagnostics of the two genera.

III.—*On the Fossil Bones of the Jamna River. By* Edmund Dean, *Serjeant, Sappers and Miners.*

[Extract from a letter, dated 2nd April, 1834, accompanying the first despatch of specimens, read at the Meeting of the 3rd July, 1834.]

I have taken the liberty of sending for your inspection some specimens from a collection of Jamna fossils, made by me during a period of nearly two years, that I was employed under Captain E. Smith, in removing the impediments to navigation in that river.

I consider myself fortunate in having been able to procure several portions of human bones, in so perfect a state, as to enable an eminent medical gentleman to class the major part of them.

With regard to the specimens before you, No. 8, (an elephant's tooth,) resembles the 2nd and 3rd plates represented in plate x. fig. 10 of Parkinson's Outlines of Oryctology; and No. 9, the 1st and 2nd plates of the same tooth, excepting that the number of the elliptic figures on the crown caused by trituration, is greater in my specimens; and that great difference in the thickness of the plates of this and the common Asiatic elephant, (a specimen of which I observe is in your possession,) which he appears to consider a distinguishing characteristic of the different species, is not so apparent in my specimens as it appears to have been in those of Parkinson. This difference, however, must be confined to the Asiatic specimens, as the length of his fossil tooth was eight inches, and it was composed of 13 plates, which would make two of them average 1·23 in.: this, allowing for the very apparent diminution in thickness of the plates towards the rear, would make my larger specimen, which averages one inch, correspond nearly enough with the plates 2nd and 3rd of fig. 10.

Nos. 10 and 11, (figs. 1 and 2, of Pl. xxxiii.) I have been led to suppose may have belonged to the species of tapir, the crowns of whose teeth are described as being divided into five transverse risings, and if by the enamel standing distinctly above the bony parts, the

term rising be understood, I consider this feature is pretty clearly indicated in the larger specimen; if they do not belong to this animal, I am utterly at a loss how to class them.

Nos. 14 and 15, I imagine, are portions of the jaws and teeth (broken off at the margins of their alveoli) of some extinct species of the Saurian order, differing in every material point from any species described by Parkinson; the transverse section of either shewing no cutting ridges, and the longitudinal section of No. 15, plainly shewing from their curved formation, the impossibility of the teeth being shed, or renewed, as also the existence of a core without any cavity; whereas a peculiar feature of the whole crocodile tribe is, the teeth are never solid in the centre. Could the larger one have belonged to that scarce monster, the Bhote of the Jamna? a species of crocodile, I believe, that has never yet been described.

Of No. 19, it will be of little use for me to take more notice, than by pointing out what appears to me to have been the outline of the crown of a circular cavity, in the centre of the tooth, which might, when perfect, have contained the nerve. Should this prove to be the case, at least one-third of the tooth must have been broken off, and then the present surface would have been a fracture. The exterior edges all round evidently present a decided fracture; but the interior surface (so beautifully irregular) has every appearance of the exterior enamel of a perfect tooth. Supposing it to have been arranged in plates (of which however there is not the least trace), the decomposition of the crusta petrosa might have occurred here, as in the elephant; but the separation (except by force) would have been rendered impossible, by the texture of the enamel that surrounds it on three sides, which is sufficiently strong, even had the crusta petrosa been withdrawn, to have held it together. It might be urged, that the exterior substance is not enamel, but an incrustation; this indeed might hide the disposition of plates; but I am inclined to believe, that the qualities of the whole and fractured parts are so intimate, that the position is untenable.

The teeth marked 0-2, 4, 6, and 16, have belonged to animals of the deer and ox tribes, but I have not the means of accurately classing them by comparison or otherwise.

No. 44, (fig. 18, Pl. xxxiii.) has defied the anatomical abilities of every one who has hitherto seen it. I have been able to form no opinion on it; never to my recollection having seen any vertebra in the least resembling it.

Specimens of Human Bones, sent Aug. 1834*.

No. 1. Supposed to be the remains of the humerus, consisting of the major part of the round head that plays in the cup of the scapula. It was dug out from under a mass of clay at a depth of about 2 ft. 6 inches.

No. 2. May either be a portion of the fibula, or of the ulna, of a child, or woman : this I imagine may easily be decided by any anatomist. It must be of considerable antiquity, as the tube originally occupied by the marrow is completely filled with a hollow concretion or spar, externally solid, and taking the exact mould or form of the concave or inner figure of the walls of the bone. In the interior hollow of this concretion a great number of very fine and sharp-pointed crystals occur, with their points or vertices apparently pointing inwards to a common elongated centre or axis ; from which it would appear that the system of this concretion was either by the increase of the crystals in size, or by their gradual projection from the exterior inwards in a radiated manner, to fill up the cavity. This specimen was found, and I have no doubt was petrified, amongst sand and shingle.

No. 3. Portion of the above, supposed to have belonged to a full-grown man.

No. 5. One of the metacarpal bones.

Nos. 46 and 47. Assimilate nearly with the 2nd and 12th dorsal vertebræ; but have belonged to different subjects. (?)

No. 15. Appears to be a molar nearly perfect, and the remains of another broken in its alveolus, with a portion of the jaw covering each, and to have belonged to some of the larger species of deer.

No. 17. Posterior extremity of a rib of a young camel, having the same peculiar concretion as No. 34. (See postscript.)

No. 22. A portion of the jaw of a camel, containing one of the grinders.

No. 34. The remains of the blade bone of the shoulder of a young camel, remarkable for the peculiar cement or concretion filling its cancelli, originally the depositaries of marrow.

No. 18, (fig. 4.) Portion of the jaw of a pig, containing four grinders.

No. 26. Extremity of one of the ribs, and No. 23, portion of the plastrom or breastplate of the Cuchwa, or mud tortoise of the Jamna.

No. 62. Portion of a rib of a buffalo, procured at a greater depth

* We have thought proper to insert this notice, in continuation of the preceding, as the specimens referred to are deposited in the Museum, and have been imagined by more than one person to be human. See the following note.

(about six feet) *under* the clay than any specimen in the collection. It was not procured *in* the clay, but imbedded in a layer of sand, which the clay had enclosed in its deposit.

[The remainder of Serjeant DEAN's collection was presented early in the following year, reaching its destination in May last. The following is his description of its contents :]

17 pieces, No. 1. Teeth and fragments of bones of camels.

27——, No. 2. Ditto and ditto of ditto of bullocks and buffaloes.

11——, No. 3. Portions of bones of elephants.

10——, No. 4. Ditto of teeth of ditto and piece of tusk of hippopotamus, (now recognized to be such.)

5 pieces, No. 5. Portion of tufa formation, occupying the place of the marrow in the tusk of an elephant. These pieces are all that remain of a very large tusk taken out of the river at *Adhâe*, from beneath a plate of *kankar :* the bony part of the tusk was fossilized, but not petrified, and from its appearance, the sepoys engaged in the work during the absence of the European non-commissioned officer, broke it up to try the experiment of its making pipe-clay or whiting for their belts, and on burning it, succeeded beyond their expectations. It is now too late to regret this great loss, but I imagine it must have been a great curiosity, as it is described to have been at least eight inches in diameter.

4 pieces, No. 6, (fig. 16.) Portions of what I am told is the sting of the sting-ray petrified ; also a perfect sting (fresh) ; and the jaw of a water rat, (fig.15.)

29 pieces, No. 7. Teeth of deer of various species.

9 ——, No. 8. Portions of antlers of ditto and other remains of ditto.

16 pieces, No. 9. Pieces of human bones.

5 ——, No. 10. Broken jaws of alligators.

5 ——. No. 11. Teeth of garial.

21 ——, No. 12. Portions of the shell, &c. of the *kachwa*, or mud tortoise.

3 pieces, No. 13. Pieces of teeth of hippopotamus.

2 ——, No. 14. Portion of jaw and teeth of goat or deer.

16 ——, No. 15. Petrified wood.

5 ——, No. 16. Specimens of pipe kankar.

2 ——, No. 17. Petrified perfect fish and shells.

I consider this fossil fish to be the greatest curiosity ever found in the Jamna. (See note.)

3 pieces, No. 18. Ribs, unknown.

[On the receipt of the first batch of specimens, a correspondence ensued, to ascertain the precise position of the fossils, and their true geological age; the opinions then upheld by their collector have been since more fully developed in his intelligent memoir published in the Journal for May. It will be as well, however, to insert here an extract from Mr. Dean's previous letter of the 16th August, 1834.]

In answer to your question, whether any specimens (fossil) have been found under the kankar strata of the general Duab alluvium? Without any hesitation, I answer, not one instance has occurred.

It may be questioned, how in the deep bunds of the Jamna, excavated for the purpose of removing the clay banks or shoals, which are so dangerous to the navigation: trees, pieces of boats, and some very few instances of bones have been discovered, at depths of from 2 to 10 feet from the upper surface of the clay, from which perhaps a crust of kankar, from one to four feet thick, has first been removed, in a perfect state of petrifaction. This circumstance, on a superficial examination, might be deemed conclusive of these specimens having been actually removed from a level lower than the kankar strata of the general Duáb alluvium, and from under what would appear to be two regular and natural strata; and that there was every probability of their occurring at the same level under neighbouring and other strata, having no connexion with the river; but, Sir, I feel quite satisfied, that at two feet in or under any natural stratum of kankar placed at any level reached by the Jamna, no specimen of animal or vegetable deposit will be found; but I shall be enabled to prove in my observations on the obstructions of the river, that both these apparently natural strata of clay and kankar, are merely deposits, and which being removed, only leave the river, at this place, at a depth it has before attained; but which, from circumstances I believe peculiar to the Jamna, and which I shall hereafter treat on, may, from the rapidity (comparative) of their formation, give an appearance of the work of ages, to deposits, which have been the work of not more than 10 or 12 years.

I am aware, Sir, that I view this subject in a different light from that in which it has hitherto appeared to you. I feel convinced, however, that the researches of Indian geologists would be amply rewarded in examining the bed of the Jamna; but I should consider the discovery of fossil remains at a level corresponding with the deepest parts of the river in the sandy soil of the Duáb as the merest possible accident; and I shall be best understood when I say my firm conviction is, that such specimens of fossil animal or vegetable remains, as

are to be met with in the Jamna, owe their existence to some peculiar quality of the water alone; and I do not consider the fossils of the Jamna as at all connected with the natural kankar formation, although at any depth that the artificial or deposit kankar formation is found, they may reasonably be looked for.

IV.—*Note on the preceding.* *By* James Prinsep, *Secretary, &c.*

More than a year has elapsed since Mr. Dean presented us with a first selection from the fossil bones he had discovered while engaged in blasting the rocks and impediments to navigation in the Jamna, under Major Irvine, and afterwards Captain Smith, of the Engineers: a few months prior to that, in November, 1833, we had been made acquainted with the fact of their occurrence by Captain Smith, to whose valuable sketches on the stratification of the Duáb alluvium and notes on the position of the fossils, published in the Journal for December, 1833, I ventured to add a few remarks, suggesting the probability of their being subjacent to the kankar, and therefore of an age anterior to the deposition of the great bed of alluvium of the Sub-Himálayan plains, when all this part of the present continent was still buried under the expanse of waters.

This opinion has been combated by Serjeant Dean in the preceding note, as well as in his memoir on the Duáb strata, printed in page 273 of the present volume.

The evidence of an eye-witness must be deemed sufficient, and the theory of original deposit with the alluvium must be given up. Still the hypothesis advanced in its stead by Mr. Dean, of the fossilizing powers of the Jamna, and the probability of all the present specimens having been mineralized in sitû, does not appear adequate to meet the difficulties of the case.

It is so far true, that the bones are found in various stages of transformation; some in a crumbling state, the interstices filled with the sand and kankar conglomerate of the river; some lined, in the cells of the bones, with calcareous spar, and chalky earth; while others are, as it may be termed, wholly fossilized, of a dark shining brown colour, ponderous, brittle, of a conchoidal fracture, and retaining little even of the bone-earth itself in their composition. The substance into which the bones are thus converted, is a hydrated oxide of iron. The animal matter of the bone is probably first replaced by it, and then the softer portions. The hard enamel of the teeth resists decomposition for a long time, and its whiteness, contrasting with the dark brown of the cavities and encasing jaw

gives these fossils the exact appearance of half picked, dried or roasted bones. A fragment of the polished *osseolite* (for it deserves a mineral appellation) yielded on rough analysis,

Phosphate and carbonate of lime, ...	17·5
Water, ...	6·0
Red oxide of iron (with alumina ?),.....	76·5
	100

the specific gravity being 4·5.

Were the fossil ingredient every where carbonate of lime, some support might be gained for the theory of the modern conversion of the bones; but while no cause can be assigned for the ferruginous impregnation, nor less for the siliceous, (of which if instances are less frequent here, they are amply supplied from the analogous fossils of Jabalpur;) we shall be justified in seeking and assigning an extraneous origin for the organic remains of the Jamna. Indeed the very specimens upon which the greatest reliance might be urged by the advocates of local formation, those in which the bone is seen entirely imbedded in the hard kankar, furnish adverse evidence; for the fragments imbedded are broken and rounded, and their substance or composition is entirely heterogeneous to the matrix itself.

When to these arguments is added the strong fact of some of the fossil animals being such as could not have existed in the dry soil of Upper India, the point is in my opinion decided. Mr. Dean mentions several imbedded specimens, and one whole animal, (the elephant at *Panchkourie**) as situated too high in the bank to be reached by the highest modern floods of the river; to these, therefore, he concedes the greatest antiquity, while of another he allows that the parts must have been washed into the situation in which they now lie, imbedded in the tufaceous conglomerate. Of the modern growth of this calcareous tufa there can be no question. The incrustations of roots and twigs (forming the pipe kankar of the specimens), and even of fragments of boats or sunken weapons, lost in wrecks on these dangerous shoals, are convincing proofs of it; but there is an essential difference between this formation and the true kankar of the banks.

There are two animals in Mr. Dean's list, the camel and the human subject, which have kept up a suspense of judgment as to the nature of his fossil series, from their never having been discovered elsewhere: this difficulty is now removed by the sight of the specimens. Dr. Pearson, and Dr. Evans, are decided, that none of the fragments

* See the description and note in page 271—3.

described as human are such. Two of these are represented in the accompanying plate as figs. 20 and 21. The former, supposed to be the head of a human femur, is more likely to be the core of the horn of some large deer; the other is far too uncertain to be identified. The teeth and remains of the camel have been subsequently disavowed by the discoverer himself (see page 278), and are found to be all of the bovine genus.

We may then conclude, that the fossils now found in the bed of the Jamna, entangled among the rocky shoals, have been washed thither from some locality in which they were originally imbedded and fossilized. From Mr. Dean's account, it is probable, that they were enclosed in the present bank, and have fallen in on its being cut away by the gradual action of the river. Should this however not prove to be the case, and search for their home be inquiringly extended to a distance; it is not necessary, as I had at first suggested, to travel back all the way to the ample store-house of fossils in the Sewálik range of the Lower Himálaya, whence such fragile materials could hardly be supposed to arrive with any vestige of form; for Lieut. Vicary has presented us with a nearer locality in the banks of the Betwá river*, and Mr. Benson, from personal knowledge, confirms the probability of this spot having been the source of the deposit in the rocks of the Jamna. I myself incline to believe that both places have their fossils, and that many more may still be found here and there where natural sections of the alluvium have been formed by rivers, although to expect to fall upon them in the digging of wells would be as chimerical (to use a homely proverb) as searching for a needle in a bundle of hay.

There is in every respect a complete analogy between the fossils of the Jamna and those fortuitously discovered by Crawfurd under the banks of the Irawadi in Ava. Their preservation is equally owing to their impregnation and conversion into hydrate of iron. The words of Professor Buckland would probably apply as well to the one as to the other:

"At the bottom of the cliff, the strand was dry, and on it were found specimens of petrified wood and bones, that had probably fallen from the cliff in the course of its decay: but no bones were discovered in the cliff itself by Mr. Crawfurd and Dr. Wallich: nor were they more fortunate in several places where they dug in search of bones in the adjacent district. This district is composed of sand hills that are very sterile, and is intersected by deep ravines: among the sand are beds of gravel, often cemented to a breccia by iron or carbonate of lime; and scattered over its surface, at distant and irregular intervals, were found many fragments of bone and mineralized wood; in some instances lying entirely loose

* See Proceedings of the Asiatic Society, 1st April, 1835, page 183.

upon the sand, in others half buried in it, with their upper portions projecting naked, and exposed to the air. They appeared to have been left in this condition, in consequence of the matrix of sand and gravel that once covered them, undergoing daily removal by the agency of winds and rains; and they would speedily have fallen to pieces under this exposure to atmospheric action, had they not been protected by the mineralization they have undergone. On examining many of the ravines that intersect this part of the country, and which were at this time dry, the same silicified wood was found projecting from the sand banks, and *ready to drop into the streams;* from the bottom of which, the travellers took many fragments, that had so fallen during the gradual wearing of the bank, and lay rolled and exposed to friction by the passing waters. These circumstances shew that the ordinary effect of existing rains and torrents is only to expose and lay bare these organic remains, and wash them out from the matrix to which some other and more powerful agency must have introduced them."

I must now briefly advert to the specimens which I have selected to form the subjects of the annexed plate.—The space is far too limited to embrace Mr. Dean's collection, much less the extensive additions received from Capt. E. Smith, at Allahabad, since I engraved my former plate (Vol. II. pl. 25), of Jamna fossils. I have therefore prudently confined myself to *distinguishing specimens*, particularly teeth, which, besides their value as the best types of the animal, are, from their compact size, and hard quality, generally better preserved than ordinary bones.

The teeth, with Dr. Pearson's assistance I have been able to identify; whereas without a complete Osteological Museum of existing animals (a desideratum we may hope, under his exertions, ere long to possess,)—it would be hazardous and a loss of time to attempt to classify the generality of mere mutilated fragments of bones. The great advantage of such a museum over even the best executed plates, was made most obvious in the course of the present examination: such of the teeth, as could be placed by the side of the actual teeth of Mr. Pearson's private cabinet, were at once referred to their correct position in the jaw of the animal to which they belonged.

The drawings of all the specimens in the Plate are of half the true lineal dimensions.

Omitting the fragments of elephants' teeth, (Nos. 8 and 9,) as being much the same as those already familiar to us from former plates, I have commenced with the most important and curious of the present series, figs. 1 and 2. The former, which was supposed by Mr. Dean to belong to the genus Tapir, proved to be the last molar but one on the right side upper jaw of the *fossil hippopotamus*, agreeing precisely with the drawing in pl. i. vol. I. fig. 3, of Cuvier's *ossemens fossiles*. This beautiful specimen is, to use the illustrious author's words, "précisement dans l'état de détrition on elle est le plus

facilement reconnoissable par les *trèfles* et les autres linéemens de sa couronne."

No. 2, is a young end tooth of the same animal, of which the points have not yet been submitted to the grinding action.

I cannot forbear inserting here an extract from the Baron's observations on the habitat of the existing hippopotamus, restricted to the central regions of Africa, from the earliest period of antiquity;—and always a stranger to the continent of India.

"Outre le Cap et le Sénégal, ou sait par Barbot at par beaucoup d'autres voyageurs qu'il y en a quantité en Guinée et au Congo. Bruce assure qu'ils sont très nombreux dans le Nil d'Abyssinie, et dans le lac Izana. Le Vaillant en a vue dans toutes les parties de la Cafrerie qu'il a parcourues; ainsi l'Afrique méridionale en est peuplée presque partout. Mais n'y en a-t-il que dans cette partie du monde? C'est une ancienne opinion. Strabon, (lib. xv, p. 1012, A., ed. Amsterd. 1707,) sur le témoignage de Nearque et d'E'ratosthenes, nie déja qu'il y en ait dans l'Indus, quoiqu'il avoue qu' Onesicrite l'eut affirmé. Pausanias est d'accord avec eux; et bien que Philostrate et Nonnus aient adopté l'opinion d'Onesicrite, il est de fait qu'aucun voyageur accrédité n'a rapporté qu'on en trouve sur le continent de l'Inde, même au delá du Gange. Buffon n'a été nullement touché du temoignage de Michel Boyn, qni en place à la Chine; c'est donc à peu près sans autorité que Linnæus, dans ses éditions x. et xii. suppose qu'il y en a aux embouchures des fleuves de l'Asie; ainsi M. Faujas paraissait bien autorisé à ne point admettre sur ce continent l'existence de l'hippopotame; mais peut être n'aurait il dû étendre sa négation à l'Asie entière: car M. Marsden, auteur de considération, place l'hippopotame au nombre des animaux de l'île de Sumatra.

"Cependant il reste à savoir si M. Marsden lui même n'a pas été trompé." —*Oss. Foss.* i. 279.

The animal, Marsden alluded to, was most probably the tapir, for Messrs. Diard and DuVaucel could find no trace of the hippopotamus either in Java or Sumatra.

Fig. 3, is the third molar right upper jaw of a very large ox, or buffalo, though the latter name, a stranger to fossil geology, should rather wait further confirmation*. The specimen corresponds precisely with the similar tooth of the largest buffalo in the museum.

Fig. 4, I at first took for the *little fossil hippopotamus* of Cuvier, vol. I. p. 334; but on placing it side by side with the upper jaw of a large hog shewn me by Dr. Pearson, in the Society's museum, it

* I have just received a note from Lieut. Baker, correcting, on this head, my notice of the animals in his and Lt. Durand's *Dadupur Museum*, in the Proceedings of the Asiatic Society, for July last, (page 409.) The buffalo, he says, has not yet been found in the *Sewálik* hills, although the ox is very common there. I possess a note and sketch, however, from Serjeant Dawe of a supposed buffalo's head, which is now on its way to our museum.

agreed with the latter in every particular, save that it was one-fifth larger.

Fig. 5, is the hindmost molar of the ox, a smaller animal than the last.

Figs. 6 and 8, are too views of the hindmost molar of one of the deer family. It corresponds precisely with a large antelope in the museum, and the Cuvierian characteristics of the teeth of the camel, antelope, goat, and sheep, which contradistinguish them from the other ruminants, namely, "qu'ils ont la face externe de leurs molaires inférieures simplement divisée en autant de piliers demi-cylindriques qu'elles out chacune de doubles croissans," are particularly marked in it. The antelope is one of the animals not hitherto known in a fossil state, therefore it will be improper to pronounce upon a single tooth; but the goat and sheep are equally so, and the specimen is too large for them, and too small for the camel.

Fig. 7, seems to be the interior spire of the tooth of a ruminant, of which the exterior has been destroyed.

Fig 9, is the second milch tooth, in germ, of the ox or deer; and fig. 10, one of the middle incisors of the latter animal.

Fig. 11, is the second or third molar tooth of the lower jaw of a horse. It somewhat exceeds in size the corresponding tooth of the celebrated racing mare Eclipse, of 15 hands high, whose skull is in Dr. Pearson's possession.

Fig. 12, is a fragment of the jaw of a small deer; the teeth are all lost, but one, which is ground down by age, until all the marks are effaced.

Fig. 13, is an incisor of some small ruminant.

Fig. 14, is rightly attributed by Mr. Dean to the water rat. The delineations on the crown differ slightly from the drawings in Cuvier's synoptical plate of the "Rongeurs;" but they agree with the existing species.

Fig. 15, are Saurian teeth, probably of the *garial* or L. Gangetica. Several fragments of the jaw of the alligator appear in the collection, and many of the vertebræ of a dark-brown shining aspect, well preserved. One of these is represented in fig. 21, (upside down,) to shew the appearance of the processes.

Fig. 16, is correctly described by Mr. Dean as the fossil sting of a ray fish, coinciding precisely with the recent specimen sent by him for comparison (of which a portion is delineated under the fossil, fig. 17).

Fig. 18. Several pointed calcareous spiracles, without organic structure, but semi-crystallized, appear to resemble the pseudostalactites thus described in Professor Buckland's memoir on the Ava fossils :—

. "There are other calcareous concretions that contain no kind of organic nucleus, but are composed of precisely the same materials as those which are found around the bones, and present many of the irregular shapes of the tuberous roots of vegetables; some of them also have the elongated *conical form of slender stalactites*, or clustered icicles—a form not unfrequently produced in beds of loose calcareous sand, by the constant descent of water along the same small cavity or crevice, to which a root or worm hole may have given the first beginning:" p. 383. Mr. Dean's collection has many examples of encrusted twigs and roots.

Fig. 19, the specimen which so much puzzled the gentlemen who examined the collection while in Mr. D.'s possession is in fact one of the most curious of the whole, nor is yet certain to what animal it should be assigned. Mr. Pearson, on seeing it, pointed out its great resemblance to the cervical vertebra of the young camelopardalis, which died in Calcutta, a few years since, and of which he preserved the skeleton. Lieut. Baker has favored me with a drawing of a similar bone, which he states to belong to a fossil elk in Serjeant Dawe's collection. (See Pl. XLIV. and the description in page 507.) There are others of much larger dimensions, he says, in the Dadupur museum, the contents of which will form the subject of a plate in the ensuing number of the Journal.

The specimen set down as a small petrified fish, which it much resembles in outward form, is, on making a longitudinal section, found to be formed of oval concentric concretions, similar to those of the country almond; possibly they are the convolutions of some shell, but certainly not a fish.

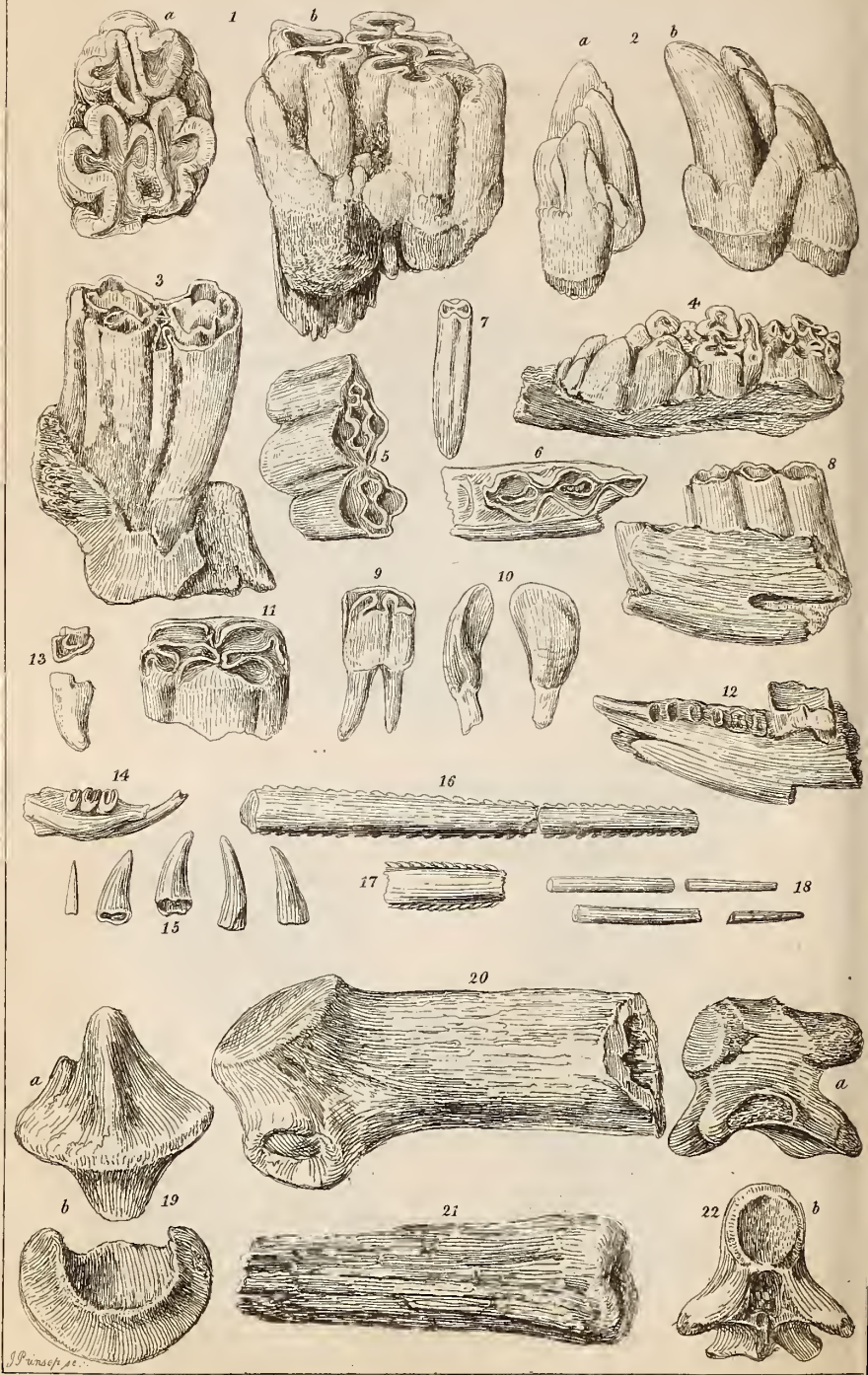
VI.—*On the Fossil Elk of the Himálaya. By Lieut.* W. E. Baker, *Engineers.*

[In a note to the Editor.]

The fossils represented in the accompanying plate, XLIV., are stated by the natives who collected them to have been found in the Haripur pass of the Sub-Himálayan range. The original specimens are in the possession of Mr. Dawe of the Canal Department.

The fragment of antler (fig. 3,) appears undoubtedly to have belonged to a species of elk, and it is possible, that the two vertebræ (figs. 1 and 2) may have formed a part of the same animal: as they are stated to have been brought from the same locality, and this statement is corroborated by the similarity of colour and general appearance of the fossils. One of the vertebræ (fig. 2) was actually

Fossils from the bed of the Jumna River



Fossil Elk from the Sub-Himalayas.

1/3rd Nat. Size.

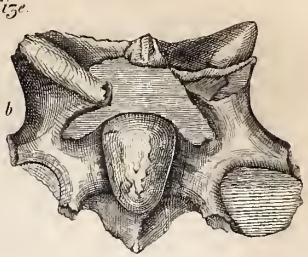


fig. 1.

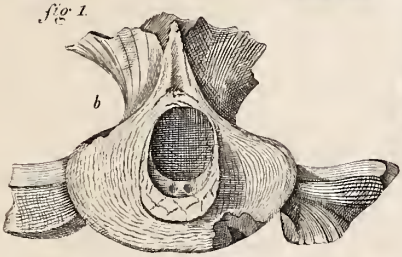


fig. 2.

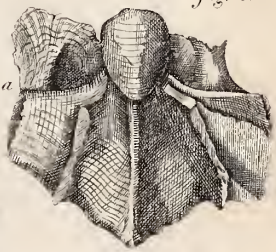


fig. 3.

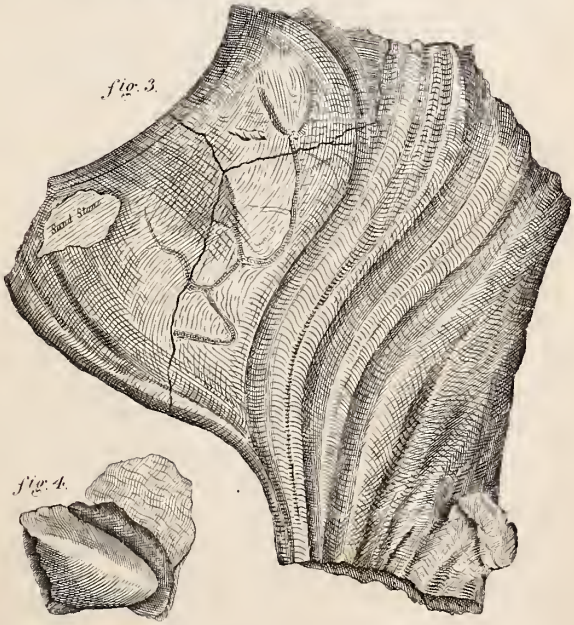
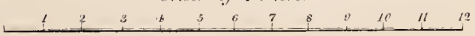


fig. 4.

Scale of Inches.



adhering to the antler at the time when I undertook to clear away the sandstone with which they were all partially covered up.

The fragment (fig. 4) consisting of one of the occipital condyles of a large ruminant, was obtained afterwards from the same person who brought the others, and who stated that he had found it in the same spot. I purpose availing myself of the first opportunity of visiting this pass, where, from the admirable state of preservation of these specimens, I hope to meet with others equally perfect.

The axis (fig. 1) must have belonged to a very large ruminant, being in linear dimension about double the size of the corresponding bone of the common bullock of Hindustán. But supposing it to have belonged to our elk, it would appear that this individual at least did not in size equal the elk, of which the remains have been found in Europe.

Besides the specimens represented in the plate, there are in the Dadupur collection, many fragments of bones, more or less perfect, of gigantic ruminants: amongst others, cervical vertebræ, far exceeding in size that represented in fig. 2.

Another year will, I hope, give us a more perfect acquaintance with the former possessors of these huge fragments; in the mean time, it may be worth while to note the discovery of the first undoubted remains of the elk, as I am not aware that this animal has been hitherto found in a fossil state in India.

Dadupur, June 9th, 1835.

VII.—*Note on the Vegetable Impressions in Agates. By Mr.* J. Stephenson.

[In a letter to the Editor.]

A few of the scientific gentlemen of Calcutta, who have seen specimens of my collection of agates from the Sone river, having imbedded the organic remains of plants, have doubted the existence of such remains; asserting (agreeable to the old notion), that the appearances are ceased by *metallic oxides, merely assuming arborescent forms,* I am well aware, that long cherished opinions are difficult to eradicate, and most people are tenacious of parting with what they have hugged as truths for half a century. I well remember when Sir Humphrey Davy explained Lavoisier's beautiful theory of combustion, that a good many of my contemporaries would not be convinced, though demonstration stared them in the face; and it was only after years of argument, that they were compelled, at last, to embrace the new and

splendid discovery. My object in this communication is, to convince those who doubt the existence of organic remains in *agates* from the Sone river, or elsewhere. I therefore beg leave to refer them to the following passages in Dr. Ure's Dictionary of Chemistry, published about fifteen years ago, which, in my humble opinion, establishes my point.

"These curious appearances (meaning the organic remains of plants) were ascribed to deposites of iron or manganese; but more lately they have been thought to arise from mineralized plants of the cryptogamous class." And again, "Dr. McCulloch has recently detected what Daubenton merely conjectured, in *mocha stone* and *moss agates*, aquatic confervæ, unaltered both in colour and form, and also coated with iron oxide. Mosses and lichens have also been observed along with chlorite, in vegetations. An onyx agate, set in a ring, belonging to the Earl of Powis, contains the chrysalis of a moth." I am also of opinion, that the arborescent appearance termed *Dendrites* in our magnesian limestone, and flag sand-stone, are the remains of mosses and lichens. I have several times tested the substance, but could only detect *carbon*, which certainly indicates their vegetable origin. I doubt not when they are effectually examined, but they will turn out to be the remains of vegetation."

The beautiful specimens from the sandstone of *Chunar* afford an excellent opportunity to those who may wish to set the matter at rest, and I must here remark, that you, as Secretary of the Asiatic Society of Calcutta, might easily accomplish the desired examination.

I also have another reason for troubling you with this communication. If the appearances in the agates *are not the remains of plants*, I have in that case asserted a *falsehood* in my advertisement, published in No. 39 of your Journal. However, with such authorities as the above mentioned, I need not fear again to assert, that the appearances in my agates are the real organic remains of aqueous plants, in a state of preservation not exceeded by any previous discovery, and altogether (as a collection), *unique*.

Dr. Ure's Geology affords further proofs to strengthen my original opinion, that the appearances in my agates are truly the remains of plants; the passage runs thus:

"If any further evidence of the aqueous origin of chalcedonies and agates were wanted, it has been afforded by Dr. McCulloch in an ingenious paper on the vegetable remains preserved in these siliceous minerals, published in the 3rd volume of the Transactions of the Geological Society. It is there shown that the mode in which the delicate vegetables thus become involved is perfectly simple, and consistent with the production of chalcedony. But we must distinguish their real causes, from pseudo specimens of black arborizations, produced by the oxides of manganese and iron, or by chlorite.

"When real confervæ are present, the vegetable form is so perfectly preserved that the plant seems to float freely as if in its liquid element. Even the green often retains its lively hue.

"Some of the large species of plants have been determined. DAUBENTON describes the *Lichen rangiferinus* and *digitatus*, plants possessed of forms which no minerals could imitate."

This account is accompanied with an engraving of a plant (a hypnum) occurring in Chalcedony, which agrees with a few in my collection; but a great many others, I dare say, are undescribed plants in a fossil state, and worthy the notice of the scientific world.

It cannot be otherwise than interesting to the Geologists of Europe, as well as to those in India, to have a description of the various species of fossil plants occurring in the Sone agates, with engravings of a few of the largest ones; and I will endeavour shortly to supply such a desideratum through your Journal as the fittest for such a purpose.

VIII.—*Chemical Analyses. By* JAS. PRINSEP, *Sec. &c.*

Under this head we propose to insert the examinations of various substances sent to us by friends, of which they will be better able to look for the results here than in detached miscellaneous notices.—ED.

1.—*Saltness of the Red Sea.*

The *Hugh Lindsay*, Steamer, having given currency to the report that the Red Sea contained more salt than the ocean, and that in consequence she had been obliged to blow off much more frequently while in that part of her voyage, Lieutenant BURNES, on his return to India on board of her, took the precaution of filling two bottles, one with the water of the Red Sea, the other with that of the Arabian Sea, which he was so kind as to send to me under charge of Lieutenant FRASER. (See Proc. Asiatic Society, page 410.)

After being allowed to stand for some hours side by side, to acquire the same temperature, their specific gravity was taken in the most accurate manner.

No. 1, Arabian Sea water, spec. grav. 1·0254 at 86°·1
2, Red Sea water,..... 1·0258 at 86°·2

The difference is certainly in favor of the latter, but it is much too small to cause any sensible effect in the blowing off.

Equal portions of the two were then analysed by the usual chemical tests, although the hydrometer result would have been quite sufficient to found a judgment upon. It was thought that perhaps the lime might be in excess in the one case, and thus cause a quicker incrustation in the boilers; but both waters on evaporation began to be turbid at the same time. The analysis was chiefly directed to the determination of the sulphuric acid and lime, the rest being performed in a rapid manner: the results were as follows on one cubic inch of each:

	Arabian Sea.	*Red Sea.*
Sulphuric acid, thrown down with barytes,	1·82 grs.	1·80
Lime, precipitated by oxalate of ammonia,	0·70	0·82
1000 grs. gave, with nitrate of silver, chloride of silver,.....	80·00	81·95
= chloride of sodium, or common salt,	32·8	33·5

Although, however, the sea in mid channel may not differ materially from the broad ocean in its contents, it may be possible that in insulated positions near shore, under a fierce sun, concentration may proceed to a considerable extent—this is the only way in which I can account for the very different result published in the London Literary Gazette, on the authority of Dr. Ure's analyses quoted in Mr. Wilkinson's work on Egypt.

The following is the paragraph alluded to:

"During my stay on the coast of the Red Sea, I had occasion to observe the remarkable saltness of its water, and succeeded in ascertaining that it contained much more saline matter than the ocean. I have since been favoured by Dr. Ure with the analysis of some water brought by me from Berenice, from which it results that the specific gravity is 1·035; that 1000 grains of water contain 43 of saline matter, of which about four grains are muriate of lime, with a little muriate of magnesia, and the remainder muriate of soda, with a little sulphate of magnesia. The specific gravity of water of the open ocean in the same latitude is only 1·028, and contains not more than 36 grains of saline matter in a similar quantity."

To which the author attaches a note, explaining, that "after the vernal equinox, the Red Sea is lower in winter; but the prevalence of the south wind after the month of September causes a considerable rise of its level."

The difference in the two cases is not more than may reasonably be explained in the above manner. The hydrometer is in all cases the safest test, and it is a pity that it had not been resorted to in the steam navigation of the Mediterranean, which has been the source of such contradictory statements.

2.—*Native Carbonate of Magnesia from South India.*

In my analysis of the Nerbudda dolomite, published in the *Gleanings in Science*, vol. I. p. 267, I expressed a desire to obtain some of this mineral, stated by Dr. Thomson to form "whole rocks in Hindustan, and to contain much less carbonic acid than it ought," though he was curious to know whether the interior portions of the mountain might not have their full proportion.

My wish has at length been gratified by Dr. Malcolmson, Sec. Med. Bd. at Madras, among whose specimens, recently presented to

the Society, are several lumps of this curious mineral. Dr. M. writes:

"The native carbonate of magnesia from Salem has again attracted attention. I at first supposed it to be a magnesite, from the great difficulty of dissolving it, but subsequent observation proved it to contain no silex. Its composition would seem to be, carbonic acid 47·5; water 4·0*; magnesia 48·5. As it is likely to become an article of commerce, and the statements regarding it are contradictory, I send some for your re-examination. It occurs in thin veins (from an inch to a foot), and also, (it is said,) in beds."

As the atomic weight of magnesia differs materially in different chemical works, I was anxious to make use of this mineral to set the matter at rest, and decide whether Berzelius, Thomson, or Brande was most to be trusted.

Three careful experiments proved, that the water contained was 0·8 per cent., while the slight adulteration of silica left, on dissolving 100 grs., was only 0·3; traces of alumina and oxide of iron were visible in the form of a delicate brown gelatinous film on adding ammonia to the solution, but none of lime, even after adding sulphuric or oxalic acid, evaporating to dryness, and redissolving in distilled water. The solid impurities, therefore, being set against the gaseous, as nearly in the proportions of the magnesian salt itself, it is evident that simple calcination of the solid mineral will give a very exact view of its constituent proportions.

Ten specimens of 100 grs. each, treated in this manner, returned from the fire, weighing respectively, 49·67, 48·26, 48·20, 48·40, 48·40, 48·38, 48·39, 48·33, 48·37, and 48·38. The first of these was in the solid form, and therefore may not have been thoroughly calcined: the average of the rest gives,

Magnesia,....	48·34	by Berzelius 48·31†
Carbonic acid,	51·66	51·69
	100.	100.

or almost precisely the composition according to this accurate chemist—which it may be remembered was the only one which would agree with my analysis of the *Jabalpur* dolomite, a definite crystallized compound of one atom of carbonate of lime and one of carbonate of magnesia.

To prove that no influential quantity of carbonic acid was retained, two of the specimens were dissolved in dilute nitric acid, in a closed glass tube—the gas extricated was less than the 50th of a cubic inch.

* Dr. Malcolmson afterwards corrects this error. A part of the carbonic acid was driven off with the water.

† By Dr. Thomson, *M.* 46·2 *C. A.* 53·8; by Brande *M.* 47·2; *C. A.* 52·8.

The mineral was found to differ considerably in weight from the statements of THOMSON and PHILLIPS—the specific gravity of two specimens being 2·970, and 2·897, at the temperature of 85°. A good deal of air was given off on its first immersion into water, and it adhered to the tongue.

Another point to be ascertained, from this mineral, was, whether the circumstance I noticed on the occasion alluded to, would hold true, viz. that calcined magnesia would not become a hydrate, like lime, on slaking, and that this earth might thus be recognized in mixtures.

Three of the calcined specimens were treated with water, which disengaged considerable heat, and then exposed in a receiver, over concentrated sulphuric acid, to be ridden of hygromctric moisture. After 30 hours, they weighed respectively 60·45, 58·7, 60·9 grs., shewing an average excess of 10·0, which is about half an atom of water (9·8). This result is so unexpected that it requires further examiuation, which I hope to be able to give hereafter.

3.—*Tin from Malacca.*

Cast blocks of the metal of the principal mines, as prepared for sale, were transmitted by Ensign NEWBOLD. With reference to my observation in the 3rd vol. of the GLEANINGS, I was contented to test their purity by the specific gravity, which was as follows :—pure tin, at the same temperature, 84°·5, being about ..... 7·290

No. 1,	from	Naning.....	7·317
No. 2,	,,	Srimenanti (new mine)	7·262
No. 3,	,,	Jompole.....	7·287
No. 4,	,,	Sungie Oojong.....	7·223
No. 5,	,,	Lúkút in Salangore.....	7·349
No. 6,	,,	Rumbowe.....	7·256
No. 7,	,,	Jelaboo.....	7·314
No. 8,	,,	Perak.....	7·299

Two specimens of the ore also accompanied :—

No. 1, from Lúkút, a fine grained black oxide of tin, had a specific gravity of 6·74, and yielded a produce of 70 per cent. of very good metal, on simple fusion, with black flux.

No. 2, from Srimenanti, was in much larger grains or lumps. It weighed, however, only 6·64 ; and yielded only 52½ (?) per cent. of metal—giving off some sulphur in the fire. It is therefore inferior to the former, but probably not to the extent stated in the above crude and single reduction.

4.—*American Self-generating Gas Lamp.*

Mr. LONGUEVILLE CLARKE has one of these curious and ingenious lamps, which are something on the principle of the little floating

candlesticks without oil, invented, I believe, by Woolaston. A metal stem passes down into the liquid, and, once heated, is afterwards kept warm by the burning vapour, which it causes to rise and issue from the gas-jets encircling the stem. Some mystery is made about the liquid, but its analysis proves to be very simple.

Specific gravity, ·760 at 32°; easily volatile, with a smell of turpentine. 100 grs. allowed to evaporate spontaneously, left barely a trace of solid matter—resinous. 100 parts, mixed with water in a measured tube, turned white, and 15 parts of pure colourless turpentine finally settled at the top of the watery emulsion. In fact, a mixture of 85 alcohol, and 15 turpentine was found to possess precisely the qualities of the liquid, burning with a clear flame, and without smell.

It is necessary to use the oil of, and not the rectified, turpentine, which latter is well known not to be soluble in alcohol.

5.—Native Remedy for the Spleen.

The late Dr. Twining gave me some pills used by the natives as a cure for the spleen. They proved to contain nothing but sulphate of copper, mixed up with meal and mucilage.

6.—Three bottles of Water from Hot Springs in Assam.

Captain Jenkins is anxious for the result of their examination; but I really am uncertain of two, which arrived in a dirty and odorous state—one, No. 3, containing an abundant putrid yellow scum, which appeared like a compound of bitumen and sulphuretted hydrogen, but was not further examined. No. 1, was a clear sweet water, having a specific gravity, ·9964 at 91°, and containing only common salt.

7.—Mineral Water from Ava.

Captain Macleod favoured me with a bottle of water from the lake near the Khyendwen river, whence a mineral salt is obtained. It had a spec. grav. of .9985 at 88°, and was consequently nearly pure. But a second bottle, filled from a well only three feet from the same lake, weighed 1·0006 at 88°, and yielded a copious precipitate to muriate of barytes, and nitrate of silver, shewing it to contain a mixture of sulphates and muriates, which are extracted by the people of the neighbourhood.

8.—Hot Springs in the Mahadeo hills, (see Vol. III. p. 390.)

The two bottles sent me by Dr. Spilsbury were so nearly pure, that it was not worth while to examine them further than by the hydrometer.

9.—Minerals from Moulmein.

The following are, I believe, the correct names of the specimens obligingly sent by Lieut. Foley, in June. Nos. 1, 4, 16, irom pyrites; 2, galena; 3, sulphuret of antimony; 8, 9, hydrated oxide of iron, hæmatitic; 10, fibrous gypsum; 11, magnetic oxide of iron; 12, 14, 17, granite with pseudo-metallic mica; 13, black oxide of tin.

10.—*Sulphuret of Molybdenum.*

This was put into my hands by a mercantile house in Calcutta, without however noticing whence it came.

It resembled graphite or plumbago so exactly in its qualities of drawing traces on paper, of being unaltered in the fire, and very gradually disappearing, that I should have been contented with these appearances, had not its specific gravity, 4·64 to 4·5, been so much higher than that of graphite, (1·4.) When heated also, white fumes, devoid of smell, or slightly sulphurous, were perceived at the moment of withdrawal from the fire.

It was digested with disengagement of red fumes in nitric acid; leaving a white insoluble precipitate in the filter, weighing 74·4 per cent. The liquid gave immediate evidence of sulphuric acid, that had been formed from the sulphur present. The white mass acted in all respects like molybdic acid, and was known to be so from its peculiar property of turning instantly blue on contact with metallic iron, lead, copper, or silver: a fact, I believe, not hitherto noticed: water is required to produce this effect. Heated red with carbonate of soda, the metal was reduced with effervescence.

I am not aware that this singular mineral is turned to any profit, but it is desirable to ascertain where it has been discovered. The high specific gravity of the Ceylon graphite, 2·37, leads me to imagine that I may have mistaken that mineral also, and invites further inquiry. It may be remembered*, that in an English cabinet of minerals, a metallic ore was also found substituted for the true Borrowdale plumbago.

IX.—*Horary Meteorological Register for Calcutta. By* Jas. Prinsep, *Sec. &c.*

The 21st September having been appointed one of the days for the combined series of horary observations, by the Meteorological Association, I could not allow it to pass without an attempt to fulfil the prescribed terms, even at the sacrifice of a night's rest.

The weather was not very favorable, although such as might be expected near the equinox: the barometer was gradually falling, indicative of blowing weather; which in fact followed a few days afterwards. The occasional violent showers checked the course of the thermometer and hygrometer; and the minimum temperature noted, was that of the rain, rather than that of radiation to the sky. As a different barometer was necessarily used during the night, care was taken to continue its readings during the day, to obtain an accurate comparison with the standard instrument at the Assay Office. The difference—·017, has been added, to bring the whole to terms of the

* See Analysis of Graphite, Gleanings, vol. III. p. 180.

standard, which I have reason to believe does not differ more than ·010 (in defect) from the Royal Society's barometer.

The thermometers were all standards from NEWMAN's, agreeing very closely together.

The diurnal tides for the two days are respectively 0·140 and 0·116, from the former of which must be deducted the gradual decrease of the pressure for 6 hours; ·732—·663÷4=·017, leaving 0·123, and ·116 + ·123 ÷2 =0·120 is the mean, which is rather above the usual amount of tide for the month of September. The nocturnal tide from $10\frac{1}{2}$ P. M. to $4\frac{1}{2}$ A. M. is ·700—·607 (with allowance for the half hours) =·083. The hours of maxima and minima correspond with those used in the registers of the Journal, and suggest the expediency of an alteration in those fixed for observation by Sir JOHN HERSCHEL, (see page 358.)

Horary observations of the Barometer, Thermometer, and Hygrometer, made at Calcutta, from 6 A. M. of the 21st to 6 P. M. of the 22nd September, 1835.

Hour 21st.	Barometer at 32°	Thermometer in the Air.	Thermometer in the Under sky.	Wet bulb therm.	wet bulb depression.	Hair hygrometer.	Rain.	Wind.	Weather.
A. M. 6	29.678	78.0	75.2	75.8	2.2			E.	Scud, cirri above.
7	.699	79.4		76.2	3.2			e.	do., increasing.
8	.715	80.0		76.5	3.5			o.	cumuli, clear above.
9	.725	81.8	80.0	76.8	5.0			e.	do.
10	.732	85.0	85.2	78.1	6.9			e.	cumuli.
11	.702	84.7	97.0	77.7	7.0	95		E.	do., fine.
noon.	.684	85.6	100.0	78.4	7.2	94		E.	do.
1	.656	86.0	96.2	78.3	7.7	93		e.	overcast.
2	.621	79.2	91,0	78.6	0.6	100		e.	hard shower, clear.
3	.592	83.1	102.4	78.8	4.3	97		e.	fair.
4	.592	82.2	88.2	78.6	3.6	97		e.	cloudy.
5	.595	82.3	85.7	78.7	3.6	97		e.	do.
6	.605	83.7	(rain.)	78.6	5.1			e.	cumuli, rain $6\frac{1}{2}$ p.m.
7	.646	78.5	74.0	76.8	1.7			o.	rain.
8	.657	79.7		77.5	2.2			e.	overcast.
9	.688	80.1		77.4	2.7			E.	do., clearing.
10	.696	79.5	76.8	76.5	3.0		——	e.	clear night.
11	.699	79.1		76.4	2.7		0.40	e.	do.
midnight.	.682	78.4		76.2	2.2			e.	do.
22nd. 1	.658	77.8		76.4	1.4			e.	do.
2	.653	77.6		76.4	1.2			e.	cloudy.
3	.636	77.7		76.5	1.2			e.	overcast.
4	.618	77.5	75.7	76.3	1.2			e.	do.
5	.621	77.7		76.8	1.1			E.	cum. stratus.
6	.643	77.7	76.8	76.4	1.3			E.	do., wet.
7	.646	78.3		76.5	1.8			E.	do.
8	.654	79.1		76.6	2.5			E.	do., clearing.
9	.662	80.3		77.1	3.2			E.	scud.
10	.663	83.0		78.1	4.9			E.	fine.
11	.647	83.9		79.6	4.2	96		E.	cumuli.
noon.	.620	83.4	93.0	77.4	6.0	94		E.	do.
1	.595	80.4	83.2	77.6	2.8	99		E.	rain, dull.
2	.568	81.5	88.4	77.5	4.0	98		E.	cumuli.
3	.544	81.5	85.8	77.5	4.0	98		E.	overcast.
4	.544	80.4	79.6	76.6	3.8	99		e.	hard rain.
5	.547	79.2	79.0	77.2	2.0	99		e.	do.
6	.574	×77.6		75.7	1.9		0.60	E.	clearing.
Mean 1st 24hours,	29.6605	80.61		77.26	3.35		0.40	e by n	showery.
Mean 2d 24hours,	29.6317	79.58		76.96	2.62		0.60	e by s	ditto.

X.—*Proceedings of the Asiatic Society.*

Wednesday Evening, the 7th October, 1835.

The Hon'ble Sir Edward Ryan, President, in the chair.

Messrs. J. Bell, G. Loch, C. S., J. M. McLeod, Mad. C. S., and Lieuts. H. M. Durand and W. E. Baker, Engineers, proposed at the last Meeting, were ballotted for, and unanimously elected Members of the Society.

Mr. J. Stephenson, proposed at the last meeting, was, upon the favourable report of the Committee of Papers, elected an Associate Member.

Read a letter from G. A. Bushby, Esq., Secretary to Government, intimating, that the Society's Memorial would be dispatched by an early opportunity.

Read a letter from J. C. C. Sutherland, Esq., Secy. Genl. Com. Pub. Instr., forwarding the list of Oriental Books, transferable to the Society.

Read a letter from M. A. Court, acknowledging his election as an Honorary Member.

Read a letter from M. E. Burnouf, Secretary to the Asiatic Society of Paris, acknowledging the receipt of Volume XVIII. of the Asiatic Researches.

Read letters from J. Forshall, Esq. Secretary to the British Museum, and H. Harkness, Secretary to the Royal Asiatic Society of Great Britain and Ireland, acknowledging the receipt of copies of M. Csoma de Körös's Tibetan and English Dictionary.

Read a letter from Professor H. H. Wilson, forwarding statements of the Society's accounts with Messrs. Parbury and Co., made up to the end of December last, exhibiting a balance of £23 11*s.* 1*d.* in favor of the Society.

Library.

Read a letter from Counsellor Von Hammer, forwarding for presentation the undermentioned books published by himself.

History of the Ottoman Empire, vol. 10th.

Jahrbucher der Literature, vols. 65, 66, 67, and 68.

Uber die Länderverwaltung unter dem Chalifate.

The following Books were also presented:

Statuti dell' Accademia delle Scienze e Belle Lettere—*by the Academy of Palermo.*

De redigendis ad unicam seriem comparabilem meteorologicis ubique factis observationibus Conventio Proposita et Tabulæ Supputatæ ab Equite Nicolao Cacciatore—*by the Author.*

Clough's Pali Grammar, with a copious Vocabulary, 1 vol., and a Dictionary English and Singalese, 2 vols.—*by the Author.*

Journal of the Royal Asiatic Society, No. 3—*by the Society.*

Moor's Oriental Fragments—*by the Author.*

Proceedings of the Geological Society of London, No. 37—*by the Society.*

The Indian Journal of Medical Science, No. 22—*by the Editor.*

Roodra Van Eysinga's Dutch and Malay Dictionary, 2 vols. and Anglebeek's Malay Grammar, 1 vol.—*by Dr. Vos.*

Hikaitismyateem, 1 vol. Malay Language and Character—*by ditto.*

Meteorological Register for August, 1835—*by the Surveyor General.*

A copy of the Tibetan, Mongol, and Chinese Vocabulary, alluded to in M. Klaproth's notice sur le Tibet, procured through Mr. Inglis of Canton, and presented by the Secretary.

The following Books received from the Book-sellers:

Illustrations of the Botany and other branches of the Natural History of the Himalayan mountains, by J. F. Royle, Esq. F. L. S. and G. S. M. R. A. S.

Sowerby's Fossil Conchology.

Lardner's Cabinet Cyclopedia, Germanic Empire, vol. 2nd.

————————————, Ireland, vol. 1st.

Museum.

A variety of bows, arrows, and other weapons from Chota Nagpore, Singhbhúm, and the Jungle Mehals, were presented by Lieut. G. W. Hamilton, 34th Regt. N. I.

Prepared skeleton of the hood of a Cobra de Capello Snake, presented by Colonel L. R. Stacy.

Literary.

Read a letter from Lieut. G. W. Hamilton, 34th Regt. N. I., forwarding two manuscript volumes of a poetical translation of part of the Sháh Námeh of Firdausí, by the late Francis Gold, Esq., Assistant Surgeon, 34th Regt. N. I.

Physical.

A memoir, with drawings, of the *Sivatherium Giganteum*, a new fossil ruminant genus from the valley of the *Markanda*, by Dr. Falconer and Captain P. J. Cautley, was read.

Also, a notice of the fossil Crocodile of the *Sewalik* Hills, by Captain Cautley.

Minerals from the neighbourhood of Kabul were forwarded by Syed Kera'mat Ali, for presentation; also a large supply of flower and fruit seeds and medicinal drugs, from the same place, and a further collection of Bactrian coins for inspection.

The seeds were directed to be transmitted to the H. C. Botanical Garden, with a request that they might be examined, and bestowed to the best advantage. The medical drugs, in like manner, to be transferred to the Medical Society.

The collection of Coins, consisting of about 750 pieces, 11 gold, 72 silver, and the rest copper, possesses one silver Euthydemus; one ditto Antilakides, (new;) two ditto Menanders; one ditto Lysius, (new;) a fine gold Kadphises. The remainder are of the Indo-Scythic, Sassanian, and Khálif dynasties.

The minerals collected by the praiseworthy and intelligent Syed are some from the neighbourhood of Kabul, and others from Demavend, &c. in Persia. Among others, a fine green talcose sectile steatite or agalmatolite from Kabul, native sulphur, gypsum, specular iron in large laminæ, &c.

A letter from Captain Conolly, accompanying the despatch, states that Kera'mat Ali has collected a large store of statistical information during his stay at Kábul while agent for the British Government, which it is his intention to put together for publication in Persian.

At the conclusion of the business of the evening, the Secretary exhibited a very powerful electro-magnet, lately received from London, which produced a brilliant spark, decomposed water freely, imparted a considerable galvanic shock to the human body, and lighted a spirit lamp.

XI.—*Extracts from Correspondence.*

1.—*Semimenstrual Inequality of the Tides.*

[We hasten to publish the following letter from the Rev. W. Whewell, of Cambridge, in correction of a quotation from the learned Professor's Essay on Cotidal Lines in our editorial notice of Mr. Sinclair's tables of the Calcutta tides, in the third volume of the Journal, p. 408. We regret that the period fixed for the contemporaneous observations on the shores of England should have passed: but we once more repeat a request to our friends on the coast to furnish the information now called for.—Ed.]

"In the number of your Journal for August, 1833, is given a table of the times of high water at the principal places between Calcutta and Point Palmiras, by Mr. P. A. Sinclair: an addition to our previous materials for a map of

Cotidal Lines which I saw with much pleasure. But I am desirous of removing a misapprehension which I perceive in the remarks accompanying this table. Mr. Sinclair has given the time of high water for every day of the moon's age, at the places contained in his table, calculated on the supposition of a daily retardation of the tide, to the amount of 48 minutes : and in the remarks a rule is quoted from my paper for the correction of the time so given. But the rule quoted is erroneous for the purpose there stated. The rule which should have been given is the following nearly.

Correction to be applied to the time of high water calculated by supposing it to be always at the same interval after the moon's transit as it is on the days of new and full moon.

	hours.										
Time of moon's preceding transit,	0	1	2	3	4	5	6	7	8	9	10	11
Correction, ... minutes,	0	−16	−31	−46	−61	−72	−75	−65	−34	0	+13	+11

The fact is, that the correction quoted from my paper belongs theoretically to the " correct establishment," or mean of all the intervals of moon's transit and tide, not to the " vulgar establishment" or interval of moon's travel and tide on the day of new and full moon, which is the establishment taken by Mr. Sinclair.

The correction which I have given above is probably not exact for India, for it is taken from the London Tide Observations ; and it would be extremely desirable, as you have observed in your Journal, to verify or correct it by observations at some stations in the Indian seas, made daily for a sufficient length of time. I may add, that the above correction is what has been called the *semi-menstrual inequality*, and does not arise from the inequality of the moon's daily motion, but from the varying angular distance of the moon from the sun, in consequence of which the solar tide sometimes coincides with the lunar, and at other times is separated from it by a large angle.

I am very glad to find you expressing your hopes that you will be furnished by your correspondents with tide observations from an extensive range of places in India. I would observe, that for the purposes of science, the daily observations themselves are much more valuable than the "establishment," or any other inference collected from them.

In conclusion, I would beg particularly to state, that directions have been given for tide observations on the whole coast of England from the 9th to the 22nd of June in this year: that I have strong hopes that these observations will also take place on the shores of other states of Europe and America, at the same time; and that it would be very interesting and useful to have contemporary observations made on the shores of India at as many places as possible."

March 21, 1835.

2.—*Mr.* Taylor's *mode of determining the Errors of Division in Astronomical Instruments.*

[Extract of a letter from Sir John Herschel, dated C. G. H. April 20, 1835.]

Feldhausen, near Wanbey, C. G. H.

"The Journal for August, 1834, contains Mr. Taylor's application of the collimating principle to the examination of the mural circle at Madras. It is somewhat singular, that not long before I had suggested to Mr. Maclean, the Astronomer Royal here, and had also written to Professor Airy at Cambridge,

suggesting its application to the circles in the British Observatories, as the only fundamental mode of enquiry into their errors, a process which coincides in almost every particular with that adopted by Mr. Taylor, and which amounts in fact to an aerial *re-division* of the circle in situ.

"I do not mention this as in any degree wishing to interfere with Mr. Taylor's just claim to independence and priority of invention; but as I consider the method in question to be one of great importance, and likely to supersede every other method of examination, I wish to obviate any misconception which may arise from the appearance in England in any of the journals, &c. of this method, as proposed by myself, without mention made of Mr. Taylor's name---what he had done being then entirely unknown to myself, and my own thoughts having been turned upon the subject in the course of a severe examination to which Mr. Maclean has been subjecting the Cape circle, and respecting which he did me the honor to consult me."

3.—*On a simple mode of Correcting the Index Error in taking observations for latitude. By Lieut.* W. P. Jacob, *Bombay Engineers.*

[In a letter to the Secretary As. Soc.]

I send you the results of a few observations, made lately at Karanja and Bombay, in illustration of a very simple method by which the errors of an altitude instrument, when employed in finding the latitude of a place, may be rendered insensible. It consists in observing pairs of stars which have nearly the same meridian altitude, the one N. and the other S. The errors of both in altitude will then be the same, but with respect to the pole they will be in opposite directions, so that the latitude resulting from the mean of the two will be free, not only from the errors of the instrument, but also from those caused by the uncertainty of refraction.

In the present instance, the instrument employed was a 10 in. circle, reading 10″ which had been subjected to very rough usage, having more than once been bent and reflattened, so that its errors sometimes amount to 40″ or more; each star was observed four times, twice with face to the right, and twice to the left, and the observations were afterwards reduced to the meridian, an operation which is very easily and quickly performed by means of the sliding rule:

At Karanja.			At Bombay Light house.		
Stars obsd.	Latitude.	Mean of each pair.	Stars obsd.	Latitude.	Mean of each pair.
β Cephei,	18 51 07.0	18 51 19.3	α Persei,.. ..	18 53 23.0	18 53 32.2
α Pisc.Aust.	18 51 31.6		γ Eridani, ..	18 53 41.4	
α Persei,..	18 51 07.6	18 51 15.5	α Geminorum,	18 52 28.3	18 53 34.4
γ Eridani,	18 51 23.4		α Cans. Mins.	18 53 40.5	
		18 51 17.4			
Diff. Lat. of Karanja and Light house by Trig. Survey,		+2 16.6			
		18 53 34.0	Lat. of Light house,.....		18 53 33.3

Here while the individual observations differ greatly, the several pairs have a close agreement, and would doubtless have been still nearer, had the altitudes been more nearly equal, for α Persei and γ Eridani differed more than 2° in alt.

By this method with a moderately good instrument, the Latitude might be found in one night within 1″, or much nearer, supposing the catalogues correct.

Mahadeo, 4th March, 1835.

[The method pointed out by Lieut. JACOB is so obvious as to have been, we imagine, at all times practised by astronomers; we however give insertion to it as likely to furnish an useful hint to amateurs and beginners.—ED]

4.—*Fossil Shells found in the Kasya Hills. By Dr.* McCLELLAND.

"Though not two days in these hills, I have found about a thousand specimens of sea shells, at various altitudes, from 1000 to 4200 feet, and even in and around the station of Churra Punjí itself. On a hasty glance, I think I have recognised of known genera, Pectens, Cardiums, Turritella, Teredo, Serpula, Melonia, Cirrus, and Pleurotoma, among my collection; but many will probably be found on examination to be new genera, and all the species or many of them at least will be found to be new.

"What makes the discovery of these remains of more consequence is, that I have found them in rocks that have been hitherto considered as primitive in India, at least; but we shall now be able to correct our classification, and to remove many contradictions that exist betweeu the result of Indian aud European observations!!

"The *Ponar* Fossil is here in great perfection, and is connected with the numulites; but it must come into a new genus, or sub-genus, which may be called annulite; it was the thing that first struck WALLICH and GRIFFITH in the rocks of the Doli river, at the base of the hills, though I did not point it out."

5.—*Note on the Pea Stalactite of Tibet. By Mr.* STEVENSON.

The accompanying sample of a calcareous concretion was a few months ago sent to me for examination, from Dr. CAMPBELL of Nípál, and found in *Tibet*. The mineral is used in medicine by the Tibetans, and called *Kári* by the inhabitants of *Nipál*.

It appears to me to be a variety of the *Roe-stone* of geologists, in a disintegrated state, probably washed from its matrix by hill torrents, and deposited in pools.

A careful analysis of an average from the bulk gave me the following result:

Description. In globular concretions, from the size of a grain of mustard seed, to that of a *pea*; colour cream yellow, and a few slightly tinged blue, very compact ---hardness equal to statuary marble, externally opake, internally crystalline, crystals needle-like, and radiated from the centre of each globule. Effervesces strongly in sulphuric, nitric, and muriatic acids, in which it readily dissolves, leaving a few grains of various coloured sand.

According to my analysis, it is composed of,

Carbonate of lime,	90.
Alumina,	5.
Silica, or sand of various colours,	5.
	100.

If I may be allowed to venture an opinion, I would say, that it is a *new mineral*, or one not described in any of the European scientific journals. If so, Dr. CAMPBELL will be entitled to the thanks of mineralogists, for his discovery. I would (though with diffidence) suggest that the mineral sh ould be named *Campbellite*, or *Tibetan comfits*, though the latter is not a scientific name, notwithstanding its comfit-like appearance.

6.—Observations of Halley's Comet, made at the Honorable Company's Observatory at Madras.

The comet first made its appearance on the 30th August, at 15th. 40m. mean time, astronomical reckoning, or August 31st, at 3h. 40m. A. M. civil reckoning —the observation are as follows :

		Madras M. T.			Right Ascension.			Declination.		
1835	D.	h.	m.	s.	h.	m.	s.	h.	m.	s.
Aug.	30	15	47	30	5	42	22	+24	43	0
	31	15	33	28	5	49	52	24	50	0
Sept.	19	15	39	40	6	10	57	29	36	30
	20	15	6	48	6	12	43	30	0	6
	23	14	54	51	6	17	29	31	36	46
	26	4	22	59	6	24	39	33	49	15

From the above observations, it would appear that the comet is about ten days later than the time predicted for its return.—At present it is invisible to the unassisted eye of *ordinary* observers, and will probably remain so until the 21st of October, when it will be situated in the constellation Coronæ Borealis, near to β, the proper time to look for it on this day will be immediately after sun-set.

T. G. Taylor,

September 28, 1835. *H. C. Astronomer.*

[The comet has been visible here since the 12th Oct., after sun-set, and is now very bright.—Ed.]

A French translation of Lieutenant Burnes's interesting Travels to Bokhara, &c. has been announced as in preparation at Paris, with notes, by Klaproth, the distinguished orientalist.—*Foreign Quarterly Review.*

XII.—*Illustrations of Nipalese Zoology, prepared for publication.*

[We have been requested to insert this catalogue in continuation of the Prospectus published in p. 356.—Ed.]

MAMMALIA.

Part 1st.

Plate I.—The Jharal, wild goat. *Capra jharal*, mihi, mature male. Inhabits the Kachar.

Plate II.—The Nahoor, wild sheep. *Ovis Nahoor*, mihi. Fig. 1, the mature male; 2, the head of mature female; 3, young male. Habitat. Kachar.

Plate III. fig. 1, the Thar antelope. *Antelope Thar*, mihi, mature male; figure 2, the Ghoral antelope. *A. Ghoral*, Hardwicke. Mature male. Inhabit central and northern divisions of Nipal respectively.

Plate IV. fig. 1, female Ghoral; fig. 2, young male.

Plate V.—The Changra or shawl goat of the Himálaya towards Nipal. Fig. 1, the larger or true shawl goat; figure 2, the lesser variety. Inhabit the Kachar.

Plate VI.—Sculls. Figs. 1 and 2, the Jhâral mas.; 3 and 4, the Nahoor fem.; 5 and 6, the Thar mas.; 7 and 8, the Ghoral mas.; 9 and 10, the Banbhera, or Himálayan variety of Ovis. Ammon. mas. junior; 11 and 12, the Phusro Jaraï, or Cervus Aristotelis. Horns cast. mas.; 13 and 14, the Ratwa Mantjac, mas. (N. B. Several of the sculls, with the horns torn off, show the cellular cavity of the core.)

Plate VII. figs. 1 and 2, head of the larger Changra; 3 and 4, scull of the lesser.

Plate VIII. fig. 1, head of the Thar, mature male; 2, scull of ditto; 3, fore-foot, and 4, hind foot of ditto.

Plate IX. fig. 1, head of the Chiru antelope, mature male; 2, direct front view of the nose of ditto, showing the position of the intermaxillary pouch and its connexion with the nares; 3, scull of ditto; 4, the inguinal pouch of ditto.

Plate X.—The Chiru antelope. *Antelope Hodgsonii*, C. Abel, mature male. *A. Gazella* of H. Smith's sub-genus. Habitat. the open plains of N. E. Thibet; fig. 2, represents the female.

Part 2nd.

Plate I. fig. 1, the male; 2, the female; and 3, the young male of the Ratwa Mantjac. Inhabits the central region of Nipal.

Plate II.—The Nipalese Paradoxurus. *P. Nipalensis*, mihi, mature female. Inhabits central and northern regions of Nipal.

Plate III.—The Wah. *Ailurus Fulgens*, mature male. Figs. 2 and 3, showing the attitudes of repose of the same. Kachar only.

Plate IV.—The Kathiah Nyool of Nipal. *Martes Kathiah*, mihi. Central and northern regions.

Plate V.—The Bharsiah of the Nipalese, mature male. *Ursitaxus Inauritus*, mihi. Pennant's Indian Badger? Fig. 1, the head of ditto, natural size; 2, scull of ditto, ditto; 3 and 4, direct and oblique views of the lower jaw; 5 and 6, ditto ditto of the upper jaw; 7, the fore foot, and 8, the hind.

Plate VI.—The Koïral of the Nipalese. *Sciuropterus magnificus*, mihi. Central and lower regions of Nipal.

Plate VII.—Different views of the preceding.

Plate VIII.—Head of the Ratwa Mantjac, mature male.

Plate IX.—Head and members of the Nipalese Paradoxurus. Fem.: 1-1, vulva and glands; 2-2, anus and pores; 3, fore foot; 4 and 5, hind foot.

Plate X.—Scull of the same animal.

Plate XI.—Front and side views of the head of the Wah. Figs. 1 and 2 exhibit the ear, denuded of all hair, and invested with it; 3, the fore foot (sole of); and 4, the hind foot.

Part 3rd.

Plate I.—The Machabba, or Malva of the Taraï. *Paradoxurus Bondar?* Inhabits the open tracts of the lower region of Nipal. Figs. 1 and 2, side and front views of the head; 3, sole of hind foot.

Plate II.—Thulo Chuah of the Nipalese. Norway Rat? all parts of Nipal.

Plate III. fig. 1, the Nyool of the Taraï. *Mangasta Cafra?* 2, the Nyool of the hills. *M.* Javanica?* Central region of Nepal.

Plate IV. fig. 1, *Viverra Indica.* The Sayer of the Taraï; 2, *Viverra Rasse*, also called Sayer. Both inhabit the Taraï portion of the lower region of Nipal exclusively; 3, head of Rasse; 4, ditto of Indica; 5 and 6, anal and genital parts, with the skin on and off; 7, the hind foot to the tarsus; 8, head of Rasse.

Plate V.—The Chittra Bilow of the Taraï. *Felis Serval?* varietas, mature male. *Felis Viverrinus* of Hardwicke? Open parts of lower region of Nipal only.

Plate VI.—The Biraloo of the Nipalese. *Felis Lynchus Erythrotus*, mihi. Central region and lower; 2, the young of ditto; 3, the Moormi Cat, *F. Murmensis*, mihi. Central region only. Mature male.

* Since ascertained to be a new species of M. auropunctata, mihi. Gold-tipped Mongoose.

Plate VII.—The Arna, *Bos Arna*, mas. The Taraï and Bhaver.

Plate VIII.—*Gulo Orientalis.* Lower hills of Nipal. Fig. 1, the fore, and 2, the hind, foot.

Plate IX.—Sculls. 1-1, the Sayer; 2-2, the Machabba; 3-3, the Mul Sampra, or *Martes Hardwickii*; 4-4, Oriental Glutton; 5-5, the Highland Nyool, or *Mangusta Javanica.*

Plate X.—Lowland Nyool. 1 and 2, the head; 3, the ear with hair reflected; 4, fore foot, and 5, hind ditto; 6-7, head of Highland Nyool; 8, its ear; 9, its fore, and 10, its hind, foot; 11, 12, 13, 14, scull of Lowland Nyool.

Part 4th.

Plate I.—The Phusro Jarai of the Nipalese. *Cervus Aristotelis* of Smith, mature males, and head of ditto. Figs. 1 and 2, from one specimen, and 3 and 4, from another.

Plate II. fig. 1, scull of *Ailurus Fulgens;* 2, upper teeth of ditto; 3, lower teeth of ditto; 4, scull of short-tailed Manis; 5 and 6, upper, and 7, lower, jaw of ditto; all nat. size.

Plate III.—The Lokriah Squirrel, *S. Lokriah*, mihi. Central region of Nipal. Nat. size.

Plate IV. fig. 1, common Musk Shrew of Nipal. *Sorex Indicus?* 2, common field mouse of Nipal; 3, Sano Chuah, or lesser common rat of Nipal. *M. Ratus.* Black rat? All natural size. Fig. 4, the scull; and 5, the hand, of the Shrew.

Plate V.—The Nipalese cat. *Felis Nipalensis*, mature male; 2, head of ditto.

Plate VI.—Black and white flying Squirrel. *Sciuropterus* Alboniger, mihi. Central and northern regions. Fig. 1, the fore foot, and 2, the hind. Nat. size.

Plate VII.—Ghoral Antelope. Figs. 1 and 2, head of mature male, 3; head of young male: 4, scull and horns of male; 5, the fore, and 6, the hind, foot.

Plate VIII.—The Buansu, or wild dog of the Nipalese. *Canis primævus*, mihi; fig. 2, reclining figure of ditto.

Plate IX.—Comparative views, on an uniform scale, of the Buansu, Indian jackal, and Indian fox.

Plate X.—Head of the Buansu, nat. size; fig. 2, small front view of ditto.

Plate XI.—Sculls of Buansu, Indian jackal, and Indian fox. Figs. 4 and 5, scull and teeth of Buansu of nat. size.

Part 5th.

Plate I. fig. 1, scull and horns of the Bara Sinha, or Indian type of the true Stag. Inhabits the Bhaver and saul forest of Nipal. Fig. 2, horns of the Chittra, or spotted Axis; fig. 3, horns of Laghuna or Pada or Porcine Axis. Two latter inhabit the Taraï. All three on an uniform scale.

Plate II. figs. 1, 2, 3, various specimens of the horns of the Phusro Jaraï of the Nipalese. *C. Aristotelis* of Smith. *Hipehaphus* of Du Vaucel; 4, horns of the Rato Jaraï; 5, horns of the Kalo Jaraï; 6, horns of the Bahraiya, *Cervus Bahraiya*, mihi. (The Maha of the western portion of these hills.) All the animals inhabit the saul forest and Bhaver of Nipal.

Plate III.—Young males of the two varieties of the musk proper to the Kachar region of Nipal.

Plate IV.—Female of the Nipalese variety of Felis Serval. Head of the same.

Plate V.—Head of the Machabba, or Malva of the Taraï. *Paradoxurus Bondar?* mature male. (N. B. Long hair moulted off.) Fig. 2, the male organs of genera-

tion with the bald secreting surface on either side the sheath of the penis; 3, female organs of generation and anus; 4, the fore foot, and 5, the hind foot. (First despatch.)

Plate VI.—Pteropus of central region: *Pt. Lencocephalus*, mihi. ⅓ of nat. size, (11 inches by 4-8; body and muzzle, uniform saturate brown; whole head and shoulders, rufous yellow.)

Plate VII. figs. 1 and 2, *Rhinolphi*, and 3, *Vespertilio*, of central region. Nat. size.

Plate VIII. fig. 1, *Pteropus;* 2 and 3, *Vespertiliones*, of central region. Nat. size.

Plate IX.—Heads and sculls of the *Vespertilionidæ* of the three preceding plates.

Plate X.—Head and members of the Langoor monkey of the central region.

Part 6th.

Plate I.—The Chikara or Chouka, *A. Tetracornis*. Figs. 1 and 2, horns of nat. size. Habitat Taraï; mature male.

Plate II.—Snakes of central region. (N. B. All of them are innocuous.)

Plate III.—Young Porcupine of central region.

Plate IV.—Tibetan Mastiff, two varieties.

Plate V.—Common Hare of central region. Figs. 2 and 3, Locusts of same region.

Plate VI.—Common Otter of Taraï.

Plate VII. fig. 1, common Toad, and 2, common Frog, of central region.

Plate VIII.—Panther and Leopard of central region. Mature males.

Plate IX.—Cabool grey-hound and scull; 3, scull of *Prochilus Labiatus*.

Plate X. fig. 1, *Prochilus Labiatus* of Taraï; 2, *Ursus Tibetanus* of central region of Nipal. Fem, junior.

Part 7th.

Plate I.—Dentition of *Rhinoceros unicornis* of the Taraï.

Plates II. and III.—Fishes of central region.

Plate IV.—Members of the fishes of the two preceding plates.

Plate V.—The Khar Laghuna, or brown Porcine Axis. Fem. Fig. 1, mature; 2, junior, from living animal in 2nd and 3rd year of age.

Plate VI. figs. 1, 2, scull and horns of Yak of Tibet, mature male; 3, 4, 5, scull of *Ursus Tibetanus* of central region, junior; 6, scull of the Lassa Mastiff, old.

N. B. For the clime and physiognomy of the three regions of Nipal, (*i. e.* the Northern, Central, and Southern ones,) see the published Catalogue of the Mammalia.

Plate VII. figs. 1 and 2, Zibet of central region of Nipal: two figures from different specimens; 3, the Urva of central and northern tracts; 4 and 5, fore and hind feet of Urva.

Plate VIII.—Indian Dûmba sheep, mature male; 2, Cabool ditto ditto, ditto.

Plate IX.—The Barwal or domestic sheep of the Kachar of Nipal; fig. 2, the Hoaniah or domestic sheep of Tibet and of the Himálaya. Mature males.

Plate X.—The Wool-bearing Paradoxurus, *Paradoxurus Lanigera*, mihi; nat. size. Habitat the northern region of Nipal.

Plate XI.—The short-tailed Manis of the central region of Nipal. (N. B. Proves to be a new species.)

Plate XII. fig. 1, Chittra or Axis; 2, Jhou Laghuna or spotted Porcine Axis; mature males. The Tarai of Nipal.

(Second despatch.)—*Extra sheets, three.*

Plate I. figs. 1 and 2, scull of Ovis Nahoor, old male; 3-4, ditto of Ovis Banbhera, junior; 5-6, ditto of musk of Kachar; 7-8 ditto, of *Antelope Hodgsonii*, old male; 9-10, ditto of a Cervi Capra.

Plate II.—Head and limbs of *Ovis Nahoor*, old male.

Plate III.—5 sketches of horns of Ratwa Muntjac, (to prove the various forms they are apt to assume.)

Two more extras.

Plate IV.—*Ursus Tibetanus*, male of two years; and head and limbs of ditto; and 3, views of scull and teeth.

Plate V.—*Ant. Tetracornis*, Chikara or Chouka, male head of ditto, separate.

(March, 1835.)—*Another extra sheet.*

Plate VI.—Capra Jhárál, wild goat of the northern region. Views of head and horns separate.

(The Tehr of the western hills is a variety with nodose horns, and probably identical with H. Smith's *C. Jemlaïca.)*

(July 1*st.)—Extra sheet.*

Plate VII. fig. 1, The Arna; 2, Gouri Gáo, mature males. (*Bubalus Arna* and *Bisonus Gavcens.)* Tarai.

Plate VIII. figs. 1, 2, Arna; 3, tame Buffaloe; 4, Yâk; 5, 6, Gáuri Gao. Sculls and heads.

N. B. The delineations of the extra sheets to be substituted for prior drawings of the *same subject.*

XIII.—*Miscellaneous Extracts.*

1.—*Influence of the Moon on the Weather. By* F. Marcet.

[Extracted from Jamieson's Edin. Phil. Journal, 1835.]

On the question whether the moon has any influence on the weather or not, there are two opposite opinions: the great mass of the people, including sailors, boatmen, and most practical farmers, entertain no doubt whatever, of the influence of the moon; whether the change of the weather at the lunar phases will be from fair to foul, or from foul to fair, none of them pretend to decide beforehand, but most of them think, that at the new and full moon, there is generally a change of some kind. On the other hand, philosophers, astronomers, and the learned in general, attribute this opinion altogether to popular prejudice. Finding no reason, in the nature of atmospheric tides, for believing that changes should take place on one day of the lunation, rather than another, they consider the popular opinion to be unsupported by any extended series of correct observations.

In the Annuaire for 1833, Arago, the learned editor, has presented the result of the observations of Schubler in Germany, during twenty-eight years, or 348 synodic revolutions of the moon. During this period of 348 new moons, &c. the number of rainy days were as follows:

It rained on the day of the new moon, ...	148	times.
Do.....do.....first quarter,.....	156	do.
Do.....do.....full moon,.....	162	do.
Do.....do.....last quarter,.....	130	do.

The observations of Schubler were made during eight years at Munich, four years at Stuttgard, and sixteen years at Augsburg. As a good meteorological register has been long kept at Geneva, the author thought it would be interesting to ascertain from the tables, (which have been carefully published in the Bibliothèque of that city,) whether, during a period of thirty-four years, viz. from 1800 to 1833, any inferences could be drawn for or against the popular opinion on the subject of lunar influence.

He finds, during these thirty-four years, the number of rainy days and quantity of water fallen, to be as follows:

	Rainy days.	Water fallen.
At the new moon,.....	123	432· lines.
First quarter,.....	122	429·6 ditto.
Full moon,.....	132	415·9 ditto.
Last quarter,.....	128	368·6 ditto.
Throughout the whole period,.....	3,657	968 in. 93 lines.

Thus it appears, that during thirty-four years, or 12,419 days, comprehending 420 synodic revolutions of the moon, there have been 3,657 rainy days. This gives for every 100 days, 29·45 rainy days; and we find, that

For every 100 days of new moon,		29·29	have been	rainy.
Do.	do. first quarter,	29·05	do.	do.
Do.	do. full moon,	31·43	do.	do.
Do.	do. last quarter,	30·48	do.	do.

Hence, it is evident, that during these thirty-four years at Geneva, the days of new moon and the days of the first quarter have been just about as liable to be rainy days as any other common day of the month; while the days of full moon and those of the last quarter have been rather more liable. But although the days of full moon have been rather more frequently wet days than those of the new moon, it does not follow that more water has fallen at full moon, than at the change. The result of observation in that respect is as follows:

For every 100 days of new moon, there fell		102·9	lines.	
Do.	do. first quarter,	do.	102·3	do.
Do.	do. full moon,	do.	90·0	do.
Do.	do. last quarter,	do.	89·9	do.

The average quantity for 100 days is 93·6 lines, whence it appears, that at the new moon, the first quarter, and the full moon, more water has fallen than on common days; at the last quarter, less. The quantity fallen on the total of the lunar phases, surpasses that on other days in the proportion of 98 to 93·6. Another question is, whether a change of weather is more liable to happen on the four principal days of the lunar phases than on common days. But it must be first decided, what is meant by the term change of weather.

This term should, the author thinks, be limited to a change from clear weather to rain, or from rain to clear weather, and not be understood to include, as some meteorologists make it, all changes, such as that from calm to windy, or from clear to cloudy, &c. As the author accepts it, the weather must have been steady during two days at least; that is, that the weather has been clear, or that it has rained more or less during two consecutive days. For example, a week has passed without rain; it rains on the eighth day, and on the ninth, the weather is again fine. In this case, according to the author's definition, there is no change of weather.

So also, if it has rained during five successive days, the sixth and seventh must

be clear, in order to constitute a change of weather. This may be arbitrary, but at least it is not vague ; and if practised, it will prevent, in the balancing of calculations, any leaning to a favorite hypothesis. To avoid another error, into which some may have fallen, the author marks no change as occurring on lunar phases, but those which take place on the very day, and never those which may happen on the evening before or on the next day. With these precautions, he finds that, during the thirty-four years, or 12,419 days, there have been 1,458 changes of weather. Of this number, 105 have taken place at the epoch of the two principal lunar phases, viz. 54 at the new moon, and 51 at the full moon. Now the whole number of principal phases during the thirty-four years is 840 ; therefore, as 12419 : 840 :: 1458 : 98·6, the number of changes which would have taken place at new and full moon, had these lunar phases had no more than the share of common days ; but instead of which, the number was 105. Of the 54 changes at new moon, 32 were from rain to fine weather, and 22 from fine weather to rain. Of the 51 at full moon, 31 were from rain to clear, and 20 from clear to rain. Thus at the new and full moon, the changes to fine weather are to those to rain as 63 to 42. Having thus proved, that the epoch of new and full moon are not absolutely without some effect on the weather, the author examined, whether this effect was confined to those very days, or extended to the day following. On the days following the new and full moon, there were 129 changes, instead of 98·6, which would have been the number had these shared the proportion only of common days. With respect to the days of the first and last quarter, the changes on these were 96, which bring them nearly to the condition of common days. It is thus shown from the tables, that the chance of change at the new and full moon, compared with the chance on ordinary days, is as 125 to 117, and that the chance on the day following these two phases, compared with the common days, is as 154 to 117. Upon the whole, therefore, this examination lends some support to the vulgar opinion of the influence of new and full moon, but none whatever to any special influence of the first and third quarters. With respect to the barometrical pressure, it is ascertained, that out of the 1,458 changes of weather, there were in 1,073 cases a corresponding rise or fall of the barometer, according as the change was from rain to fair or the contrary. This is nearly as 3 to 4. Of the 385 false indications of the barometer, 182 were on a change from rain to clear, and 203 on a change from clear to rain. Finally, of the 385 anomalies of the barometer, 17 were at full moon, and 10 only at new moon.

2.—*On the Composition of the Rangoon Petroleum, with Remarks on the Composition of Petroleum and Naphtha in general.* By William Gregory, M. *D. F. R. S. E.*

The author first adverted to the discovery, nearly about the same time, of paraffine by Reichenbach, and of petroline by Dr. Christison. The former occurred among the products of destructive distillation ; the latter was found in the Rangoon petroleum, and they were soon found to be identical. Reichenbach's researches on naphtha were then quoted, by which it appears, that that indefatigable observer could not discover, in the kind of naphtha which he examined, any trace either of paraffine, or of any other product of destructive distillation. On the contrary, he found, naphtha to possess the characters of oil of turpentine, a product of vegetable life ; and he succeeded in obtaining a precisely similar oil from brown coal, by distillation at 212°. The facts had led Reichenbach to

the conclusion that naphtha in general is not a product of destructive distillation, and consequently, must have been separated at a comparatively low temperature.

The author showed, that Dr. Christison's discovery of paraffine, of which Dr. Reichenbach was necessarily ignorant, is inconsistent with this view: and detailed some experiments, by which he has rendered highly probable the existence in petroleum of eupion, another of the products of destructive distillation. This substance is a liquid of sp. gr. 0·655, boiling at 110°, and very fragrant. The author obtained from the Rangoon petroleum a liquid of sp. gr. 0·744, boiling at 180°, and rather fragrant.

The oil of turpentine, as is well known, boils at 280°, and has a sp. gr. of 0·860: so that, at all events, the naphtha from the Rangoon petroleum is not oil of turpentine. This was farther proved by the tests of nitric acid and iodine. Similar experiments on one or two other species of naphtha led to similar results. They all yielded a liquid of sp. gr. about 760, and, consequently could not be oil of turpentine. The kinds of naphtha tried were Persian naphtha, obtained from Dr. Thompson, and commercial naphtha, sold by M. Robiquet, at Paris.

The author concluded, that if the naphtha examined by Reichenbach were genuine, there must be two kinds of naphtha; one a product of destructive distillation, the other the oil of turpentine of the pine forests of which our coal-beds are formed, separated by a gentle heat, either before or after their conversion into coal. It is obvious that our common coal-beds have never yet been exposed to a heat sufficient for destructive distillation, since they are destroyed by a moderate heat; and we may therefore expect the petroleum of these coal-beds to be of the kind described by Reichenbach; while the Rangoon and Persian petroleums, being products of destructive distillation, must have their origin, if in coal-beds at all, in such as have been exposed to a high temperature, and must consequently be very different from the oridinary coal-beds. In confirmation of this view, it may be stated, that Dr. Christison could find no paraffine either in the petroleum of St. Catherine's or in that of Trinidad or Rochdale.

The author finally directed attention of the application of the paraffine as a material for giving light, as, when pure, it burns with a clear, bright flame, like that of wax, and might doubtless be obtained at a cheap rate in the East.—*Edin. Phil. Journ.* 1835.

[Since the above was in type, we have received a copy of the papers, and a specimen of the paraffine from Mr. G. Swinton, with a list of queries which we will endeavour hereafter to resolve.—Ed.]

3.—*Extracts from Proceedings of Zoological Society of London.*—1834.

August 12.—A collection of *land* and *fresh-water Shells*, formed in the Gangetic Provinces of India by W. H. Benson, Esq., of the Bengal Civil Service, and presented by that gentleman to the Society, was exhibited. It comprised forty species, and was accompanied by a descriptive list prepared by the donor, and also by detailed notices of some of the more interesting among them. These notices were read: they are intended by Mr. Benson for publication in the forthcoming No. of the 'Zoological Journal.'

From the time that he first became acquainted with the animal of a *shell* resembling in all respects, except in its superior size, the European *Helix lucida*, Drap., Mr. Benson regarded it as the type of a new genus of *Helicidæ* intermediate between *Stenopus*, Guild., and *Helicolimax*, Fér. He had prepared a

paper on this genus, for which he intended to propose the name of *Tanychlamys*; he finds, however, that Mr. Gray has recently described (Lond. and Edin. Phil. Mag., vol. v. p. 379), the same genus under the name of *Nanina*. The generic characters observed by Mr. Benson are as follows:

Nanina, *Gray*.

Testa *heliciformis, umbilicata; peritremate acuto, non reflexo.*

Animal *cito repens. Corpus reticulosum, elongatum. Pallium amplum, foramine communi magno perforatum, peritrema amplexans; processubus duobus transversè rugosis (quasi articulatis) omni latere mobilibus instructum, unico prope testæ aperturæ angulum superiorem exoriente, altero apud peripheriam testæ. Os anticum inter tentacula inferiora hians; labia radiato-plicata. Tentacula superiora elongata, punctum percipiens tumore oblongo situm gerentia. Penis prægrandis; antrum cervices elongatum latere dextro et prope tentacula situm. Solea complanata pedis latera æquans. Cauda tentaculata; tentaculum subretractile, glandulâ ad basin positâ humorem viscidum (animale attrectato) exsudante.*

Mr. Benson describes particularly the habits of the species observed by him, which he first discovered living at Banda in Bundelkhand on the prone surface of a rock. The animal carries the shell horizontally, or nearly so; is quick in its motions; and, like *Helicolimax*, it crawls the faster when disturbed, instead of retracting its *tentacula* like the *Snails* in general. In damp weather, it is rarely retracted within its shell, the foot being so much swelled by the absorption of moisture, that if it is suddenly thrown into boiling water, the attempt to withdraw into the shell invariably causes a fracture of the aperture. In dry weather, the foot is retracted, and the aperture is then covered by a whitish false *operculum*, similar to that of other *Helicidæ*. The two elongated processes of the mantle are continually in motion, and exude a liquor which lubricates the shell, supplying, apparently, that fine gloss which is observable in all recent specimens. The fluid poured out from the orifice at the base of the caudal horn-like appendage is of a greenish colour; it exudes when the animal is irritated, and at such times the caudal appendage is directed towards the exciting object in such a manner as to give to the animal a threatening aspect.

Of several specimens brought to England by Mr. Benson in 1832, one survived from December, 1831, when it was captured in India, until the summer of 1833.

Another *shell* particularly noticed by Mr. Benson is the type of a new genus, allied to *Cyclostoma*, which he has described under the name of *Pterocyclos* in the first No. of the 'Journal of the Asiatic Society of Calcutta.'

Specimens of a species of *Assiminia*, Leach, were preserved alive in a glass, replenished occasionally with fresh or salt-water, until after the vessel in which Mr. Benson returned to England had passed St. Helena.

A *Snail*, obtained near Sicrigali, and the river Jellinghy, one of the mouths of the Ganges, is characterized by Mr. Benson as Helix *interrupta*.

In the character of the excrement being voided from an opening in the terminal and posterior part of the foot, instead of from the *foramen commune*, the animal of *Hel. interrupta* differs most materially from the other *Helices*. The angulated periphery of the shell shows an approach to *Carocolla*; but Mr. Benson is not aware that the animal of this genus differs from that of *Helix*. From *Hel.*

Himalayana, Lea, the *Hel. interrupta* is distinguished by its peculiar sculpture; its spire is also more exserted.

The collection also contained specimens of an *Arcaceous Shell* found in the bed of the Jumna at Hamírpur in Bandelkhand. Mr. Benson proposes for it the generic appellation *Scophula*.

Referring to specimens contained in the collection of a new form of *Solenaceous Shell*, described by him in the 'Journal of the Asiatic Society of Calcutta,' under the name of *Novaculina*, Mr. Benson describes also a second species of the genus which he has recently obtained from South America, and points out the characters which distinguish it from *Nov. Gangetica*.

The following Note by Mr. Benson, relative to the importation of the living *Cerithium Telescopium*, Brug., adverted to at the Meeting on March 25, 1834, (vol. v. p. 145,) was read.

"The possibility of importing from other countries, and especially from the warmer latitudes, the animals which construct the innumerable testaceous productions that adorn our cabinets and museums, the accurate knowledge of which is so necessary, to enable the conchologist rightly to arrange this beautiful department of nature, must be an interesting subject to every naturalist, and will render no apology necessary for the following notices extracted from my journal. Their publicity may incite others who may have opportunities of trying the experiment, to follow the example.

"January, 1832. Observed near the banks of the canal leading from the eastern suburb of Calcutta to the Salt Lake at Balliaghát, heaps of a *Cardita*, with longitudinal ribs, of a large and thick *Cyrina*, and of *Erithium Telescopium*, exposed to the heat of the sun, for the purpose of effecting the death and decay of the included animals, previously to the reduction of the shells into lime.

"Early in the month I took specimens of them, and leaving them for a night in fresh water, I was surprised to find two *Cerithia* alive. I kept them during a fortnight in fresh water, and on the 22nd January, carried them, packed up in cotton, on board a vessel bound for England. After we had been several days at sea, I placed them in a large open glass, with salt water, in which they appeared unusually lively. I kept them thus, changing the water at intervals, until the 29th May, when we reached the English Channel. I then packed them up, as before, in a box, and carried them from Portsmouth to Cornwall, and thence to Dublin, which I did not reach until the 14th June; here they again got fresh supplies of sea-water at intervals. One of them died during a temporary absence, between the 30th June and 7th July; and on the 11th July, the survivor was again committed to its prison, and was taken to Cornwall, and thence to London, where it was delivered alive to Mr. G. B. Sowerby on the 23rd July.

"This animal had thus travelled, during a period of six months, over a vast extent of the surface of the globe, and had for a considerable portion of that time been unavoidably deprived of its native element."—W. H. B.

4.—*Minerals of the Trappean Rocks of Bombay.*

The following list of the minerals which occur in the volcanic rocks of the several islands in the harbour of Bombay is extracted from a paper by Dr. R. D. Thomson in the '*Records of General Science*,' *for April*, 1835.

1. Basalt of Salsette: dark-grey or blackish, with numerous crystals of olivine and augite interspersed.

2. Black basalt of Elephanta, presenting a homogeneous aspect when fractured, but frequently containing minute portions of olivine, sometimes in rounded granules, at others crystallized: texture highly indurated. This and the other variety fuse before the blowpipe per se into a mass resembling pitchstone. The celebrated figure of the elephant, close to Galliputi, consists of this rock, but it appears to be of limited extent.

3. Amygdaloid, appearing at the great temple of Elephanta, possesses a hard wacke basis, containing cavities filled with rock crystal and zeolites, &c. The rock has a purplish aspect, and is evidently decaying in many situations, by the readiness with which the atmospherical influences act by the medium of the amygdaloidal cavities. Before the blowpipe this rock simulates fused basalt.

4. Yellowish gray claystone porphyry, at the lower cave of Elephanta. The predominating particles have a yellow resinous appearance, with a black basis.

5. Green claystone porphyry, appearing at Babula Tank: fine ground, and admitting of a good polish, interspersed with dark-coloured soft particles, which have an even fracture, and appear to be small masses of indurated clay.

6. Amygdaloid, with a light-coloured porphyritic basis and green cavities, accompanied generally with large crystals of calcareous spar from the neighbourhood of Parell. The calc-spar is sometimes dark-coloured, probably from the effect of reflected light.

7. Numerous large fragments of shell conglomerates may be observed on the shore of Elephanta, consisting of a nucleus of porphyry, or amygdaloid, closely surrounded by adhering bivalves, which afford means of extending the limits of the growth of the mangrove.

The amygdaloidal cavities contain numerous species of various classes of minerals, of which under the genus *silica* may be enumerated, 1, rock crystal, termed *palanca* in the Malabar language, and *spadika* in the *Grantham* dialect; 2, quartz; 3, milk and rose do.; 4, calcedony; 5, amethyst; 6, agate; 7, cornelian; 8, oriental jasper, or bloodstone, rare at Bombay, but abundant in Gujerát and Cambay.

Of the alkaline class are; 1, calcareous spar; 2, mesolite, whose composition (by Thomas) is expressed by the formula $3\ \mathrm{Al.\ S} + (\frac{1}{2}\ \mathrm{C} + \frac{1}{2}\ \mathrm{N})\ \mathrm{S}^3 + 3\frac{1}{4}\ aq.$

3. Heulandite, in Caranja and Elephanta, in large white crystals.

Of the cornelians a beautiful variety is brought to Bombay, containing elegant arborizations resembling the ramifications of inclosed mosses, a phenomenon which in many instances appears to be justly attributable to such a cause. The remark of Pliny, "Infestantur plurimis vitiis—aliis capillamentum rimæ simile*," with regard to rock crystal, refers to the presence of titanite. The same naturalist observes of rock crystal, "Oriens et bene multis, sed Indicæ nulla præfertur†," which is ignorantly denied by Garcias ab orto, who was for several years viceroy of India. He says, "nullo autem ex prædictis loco crystallus invenitur quemadmodum nec per universam Indiam‡."

The bloodstone, or oriental jasper, appears to be imported from Gujerát. It is characterized by presenting a greenish appearance, with numerous blood-red streaks or veins, traversing it in various directions. It is to the latter species, or to the mock pearls so frequently employed as ornaments by the inferior castes, that we are to refer the expression of the historian of Alexander "lapilli ex auribus pendent§." But with regard to the "gemmas margaritasque mare litoribus infundit," it is not easy to give a satisfactory explanation, although the latter obviously relate to the pearls of the Indian Seas.

* Hist. Nat. Lib. xxxvii. c. 2. † xxxvii. 2. ‡ Hist. Arom. i. c171. 171.

§ Quint. Curt. i. 8. c. 9.

Meteorological Register, kept at the Assay Office, Calcutta, for the Month of September, 1835.

Day of the Month.	Observations at 10 A. M.							Observations at 4 P. M.							Register Thermometer Extremes.		Rain.	Wind.			Weather.		
	Standard Barometer, at 32°.	Wet Barometer, at 32°.	Aqs. Ten. deduced.	Thermometer in air.	Diff. or M. T. Depress.	Leslie's Dif. Hygrom.	Hair Hygrometer.	Standard Bar. at 32°.	Wet Bar. at 32°.	Aqs. Ten. deduce d.	Thermometer in air.	Diff. or M. T. Depress.	Leslie's Dif. Hygrom.	Hair Hygrometer.	Cold on roof.	Heat in sun.		Morning.	10 A. M.	4 P. M.	Day-light.	10 A. M.	4 P. M.
1	29,591	28,410	1,173	82,6	2,3	2,4	98,	,484	,310	1,174	84,3	4,1	3,0	97,	75,3	98,8	1,00	NE.	se.	se.	clear,	overcast,	drizzle.
2	,711	,540	,171	83,7	3,4	3,6	96.	,607	,356	,251	85,9	5,6	5,8	91,	76,0	102,2		SE.	sw.	s.	cumuli.	fine.	fine.
3	,668	,496	,173	84,7	3,7	3,8	95.	,597	,297	,300	86,3	5,4	5,7	91,	77,0	119,5		o.	w.	sw.	fine.	do	fair.
4	,645	,347	,297	86,1	4,1	4,3	97.	,463	,176	,287	87,5	4,3	4,0	96,	80,4	125,4	0,10	NW.	sw,	nw.	clear.	cum. str.	threatning.
5	,660	,426	,234	85,9	4,8	5,2	93,	,556	,247	,309	88,2	8,3	8,0	7,	77,5	103,1		E.	se.	se.	cumuli.	do	fine.
6	,775			83,5	6,1			,700			82,2	4,6			76,2	88,9		E.	ese.	o.	strati.	cumuli.	rain.
7	,733	,543	,190	85,0	5,6	5,0	93.	,627	,448	,179	84,9	4,2	3,9	96.	75,0	95,2	0, 35	E.	se.	se.	fine.	do	dull.
8	,709	,551	,158	84,1	5,2	4,1	95,	,590	,336	,254	86,7	6,3	5,6	92,	77,0	103,6		S.	sw.	sw.	cir. cum.	cloudy.	cumuli.
9	,696	,497	,199	85,2	4,6	4,3	95.	,569	,373	,196	85,2	5,7	5,1	93,	79,1	107,5		S.	sw.	sw.	do	do	dull.
10	,708	,484	,224	85,3	5,2	5,0	93.	,583	,260	,323	88,0	8,2	7,6	89,	77,8	112,2		s.	sw.	sw.	fine.	cumuli.	cum. str.
11	,724	,482	,242	86,4	6,1	6,2	91,	,605	,280	,325	88,6	10,1	9,6	83,	77,8	113,0		o.	se.	se.	do	fine.	fine.
12	,720	,447	,273	87,4	7,0	6,8	89,	,606	,270	,336	89,4	10,2	9,3	84,	77,5	118,0		o.	ne.	N. E.	clear.	do	do
13	,709			85,1	7,5			,570			88,0	14,7			76,1	122,2		n.	N.	n.	do	do	do
14	,611	,319	,292	80,3	6,2	6,1	91.	,508	,162	,336	89,4	8,1	7,8	88,	80,0	119,5		n.	ne.	o.	do	do	nimbus.
15	,663			83,4	6,6			,552			82,5	5,6			78,4	91,5	0,40	NE.	NE.	ne.	cum, str.	dull	showery.
16	,491	,347	,144	83,4	3,4	3,3	98,	,440	,392	,048	82,0	3,0	3,1	98,	74,5	76,1	4,00	N.	NE.	ne.	sett. rain.	storm.	storm.
17	,696	,606	,090	81,7	2,6	3,0	99,	,610	,484	,126	83,6	3,0	2,9	98,	72,1	85,0		S.	sw.	sw.	do	overcast.	drizzle.
18	,769	,735	,034	81,3	4,4	3,8	96,	,632	,485	,147	84,0	4,9	4,4	95,	75,4	101,2	0,24	W.	sw.	se.	cum. cir.	fine.	cloudy.
19	,722	,583	,139	83,5	4,2	3,8	96,	,594	,412	,182	84,7	4,6	4,6	94,	75,6	99,3		o.	sw.	sw.	do	do	hazy.
20	,739			79,8	2,5			,634			82,2	6,4			72,3	89,8		o.	s.	o.	sett. rain.	rain.	fine.
21	,714	,589	,125	82,7	3,0	3,0	98.	,594	,438	,156	84,1	3,6	2,8	94,	75,2	98,2	0,44	e.	ne.	e.	scud.	cumuli.	cloudy.
22	,658	,536	,122	83,1	3,7	4,2	94,	,544	,434	,110	83,4	3,8	2,5	99,	74,0	102,1	0,80	E.	e.	e.	heavy rain.	do	rain.
23	,653	,600	,053	82,2	2,7	2,7	99,	,560	,484	,076	82,2	3,6	2,7	100,	74,0	81,4	0,85	E.	se.	se,	rain.	rain.	overcast.
24	,713	,596	,117	82,3	3,3	2,6	100,	,608	,523	,085	82,0	3,3	3,0	95,	73,5	82,0	0,74	ese.	se.	se.	cumuli.	cloudy.	drizzle.
25	,742	,647	,095	82,5	3,6	2,6	97,	,663	,628	,035	81,1	2,5	2,7	98,	73,5	80,0	0,30	S.	se.	se.	gale.	rain.	cloudy.
26	,724			81,0	5,5			,689			80,0	4,1			74,2	85,0	0,12	S.	s.	sw.	rain.	do	cum. rain.
27	,752			80,0	8,6			,647			83,7	13,0			75,2	107,1		s.	sw.	W.	clear.	clear.	clear.
28	,762			82,3	5,8			,679			85,8	11,2			77,0	109,8		sw.	sw.	w.	cloudy.	cumuli.	fine.
29	,810			83,2	6,0			,710			86,8	11,4			73,5	113,5		S.	s.	w.	fine.	fine.	clear.
30	,804			84,6	7,8			,746			87,0	19,9			78,5	121,5		s.	o.	n w.	clear.	clear.	do
Mean.	29,702	28,514	1,169	83,7	4,8	4,1	95.	,599	,371	1,201	85,0	6,8	5,0	93,	76,0	101,8	9,34	changeable.			showery, seasonable.		

A slight leak having been discovered in the pluviometer hitherto registered, the rain has this month been inserted from the Surveyor General's register, merely putting each entry back one day to correspond with the actual time of fall. The rain for three months past should be also increased nearly one-fourth, viz. June, 12·71, July, 18·12, August, 12·12; or 13·92, 19·66, and 13·10, if the *lower reservoir* be preferred.